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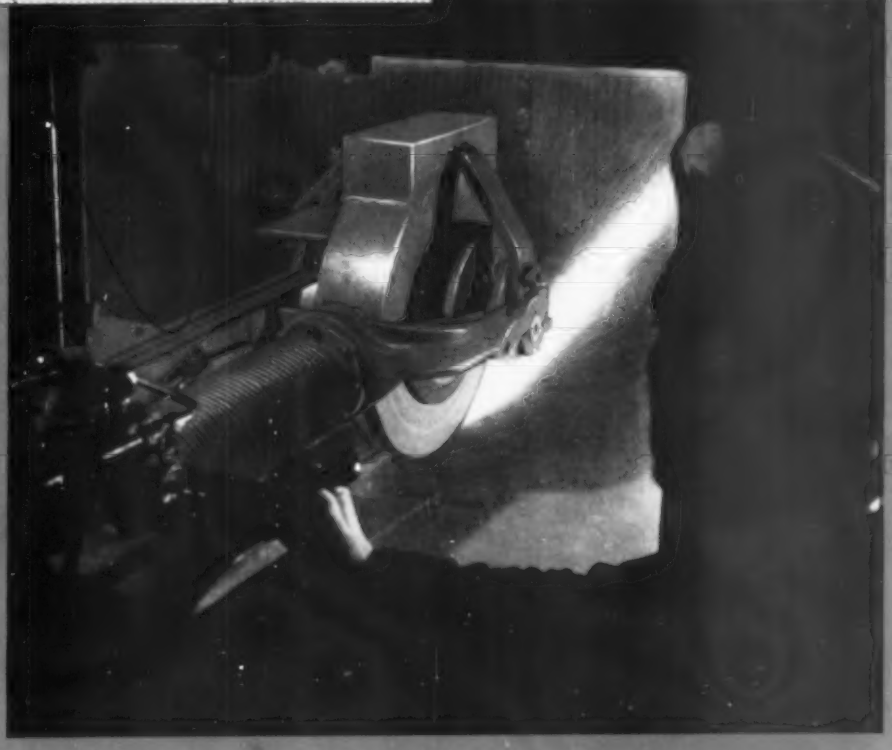

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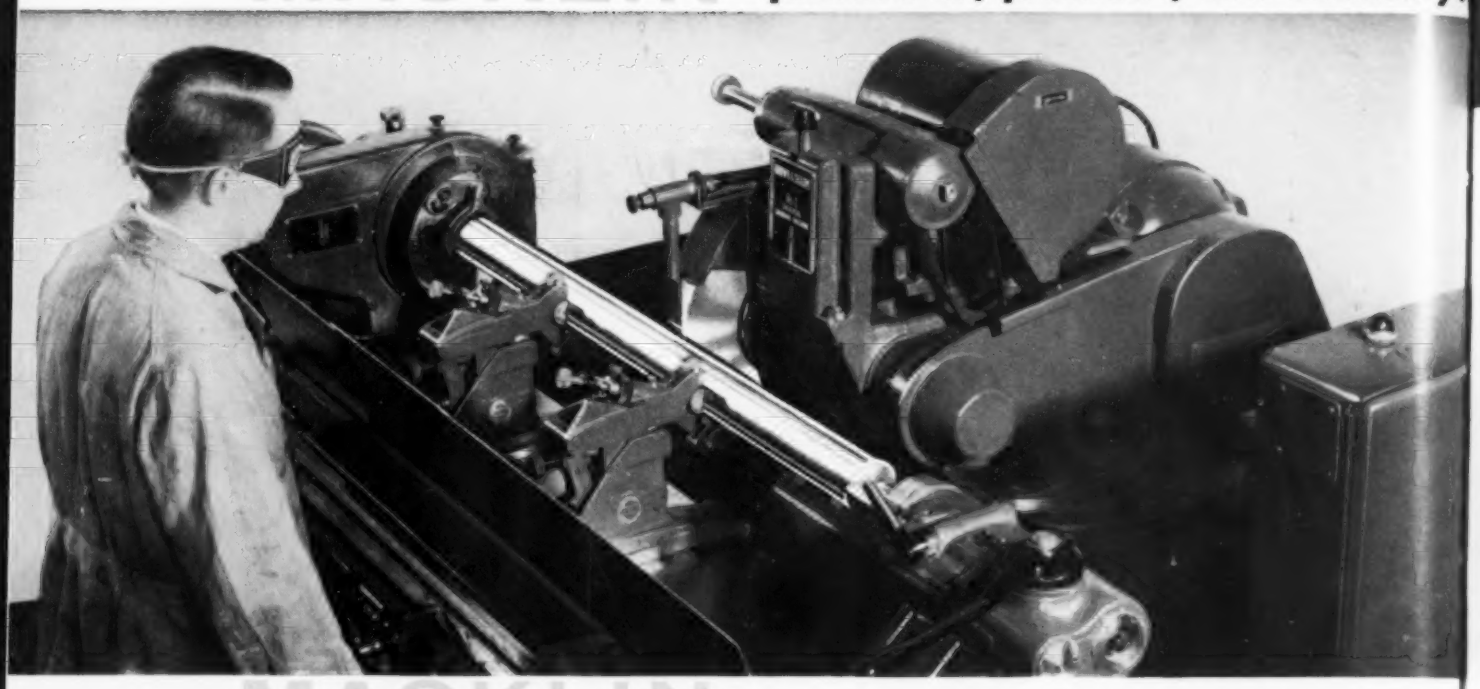
In cylindrical grinding, too, for production, precision, and economy.



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Whatever cylindrical grinding method you use, traverse, plunge cut, or form, MACKLIN cylindrical wheels finish straight or tapered pieces to exact size and close tolerance.

Macklin cylindrical "wheels of profit" give you built-in wheel uniformity . . . precise wheel balance . . . good cornering ability . . . free and cool cutting . . . and longer wheel life.

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ROLLS—"Rapid stock removal on roughing passes and still produces required finish easily without chatter on forged steel reduction mill rolls." A70 L II B2.

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WHEREVER ABRASIVE OPERATIONS ARE PERFORMED

GRINDING and FINISHING

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By J. E. Price

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The development of lightweight, accurate, portable wheel-forming attachments has made form dressing of grinding wheels a precision operation.

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April Cover: Grinding the scale and surface imperfections from steel prior to rolling—when the material is in the form of blooms, slabs, and billets—has long been one of the most spectacular abrasive operations. And men handling the swing frame grinders, often with scrap iron hung on the handles to increase the pressure, have been symbols of strength and durability. But now, with machines completing their conquest of the field by the solution of the problems in mechanical snagging of small billets, and with the higher speeds and greater stock removal possible with hot-pressed wheels, the swing frame grinder hand is off to join Paul Bunyan and John Henry, that spike-drivin' man, in whatever Valhalla there is for yesterday's musclemen.

Subscription rates: $6.00 per year in U.S.A. $7.50 per year elsewhere.
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In CASE after CASE after CASE after CASE

An automobile manufacturer in Michigan used Norton natural diamond wheels with resinoid bond, size 3¾ x 1½ x 1¼, type D11V9 for dry sharpening carbide tipped broaches. Compared to a competitive diamond wheel of similar specifications, the Norton wheel removed stock at a cost of $25.36 per cubic inch of carbide. Stock removal costs for the competitive wheel were $34.50 per cubic inch. The Norton wheel reduced grinding costs 26.5%.

A mid-western manufacturer of small gasoline motors used a Norton resinoid wheel having man-made diamond abrasive, size 6 x ¾ x 1¼, type D6A2C to wet-grind single point carbide tools. These Norton wheels, compared to another brand of similar type and description, provided twice the life of the competitive product.

A mid-western manufacturer of machine tools ran Norton resinoid wheels, of mined diamond, size 6 x ½ x ⅝ type D6A9 against a competitive wheel of comparable type and description for the dry grinding of carbide milling cutters. The Norton wheel lasted 521 hours compared to 300 hours for the other wheel. The Norton wheel provided 73.6% more usable life.

A western producer of aluminum used Norton resinoid-bonded diamond wheels of man-made abrasive to dry-grind carbide milling cutters. Wheel size was 5 x 1¾ x 1¼, Norton type, D11V9. Previously, the customer had been using a competitive wheel of similar specifications. The Norton wheel, compared to the other brand, cut faster and had twice the useful life.

Norton Diamond Wheels –Mined or Man-made– out-grind them all

Norton was first to introduce all three kinds of diamond wheel bonds: resinoid, metal and vitrified . . . does all its own checking and sizing of diamonds . . . duplicates wheel specifications with constant accuracy.

Resinoid bonded diamond wheels are best for such jobs as precision grinding of cutters, form tools and die blanks. They are available in several bond types — B type for wet grinding — B6 type for dry grinding.

Vitrified bonded diamond wheels are used for sharpening single-point cutting tools, grinding chip grinders and for surfacing carbide dies.

Metal bonded diamond wheels are sometimes preferred for grinding chip breakers, for certain offhand grinding jobs and for cutting off sintered carbide blanks, etc.

Norton leadership in diamond wheel manufacture continues whether the diamonds used are natural or man-made.

As the world's largest producers of abrasives, Norton maintains the most modern equipment designed for product quality control. Expert engineering assistance and prompt deliveries are also geared to provide the wheels you need for top quality, lowest cost carbide grinding. For these helpful services, see your Norton Abrasive Engineer or Norton distributor. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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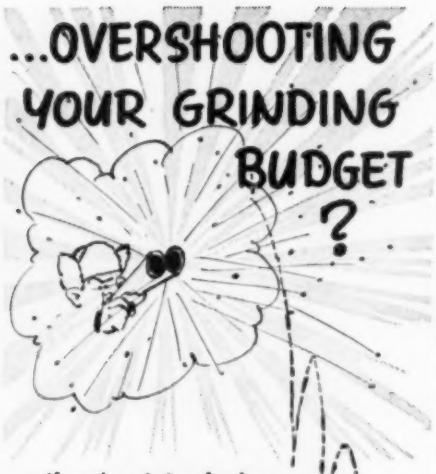

. . . if you're aiming for lower grinding costs and falling short . . . if you can't keep your tools "pointed" within your grinding budget, why not try United States Diamond Wheel Co.'s on-the-job "PROGRESSIVE SPECIFICATIONS." They'll show you the ultimate in high-finish production grinding. This scientific system has proved profitable on every application and it is warranteed to do the same for you.

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PRESSURELOK (the Performance bond) makes the best of Diamond wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformly at the ideal rate of Diamond usage.

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Editor's Mail

Grinding Bearing Balls

Sometime ago an article appeared in one of your GRINDING and FINISHING magazines, I believe it referred to grinding bearings ball type. I am interested in grinding stainless steel and carbide balls ranging in size from three quarters to two inches in diameter. Any information you can furnish will be appreciated.

Fluid Packed Pump Co.
Preston Chitty

In the December, 1956 issue of GRINDING and FINISHING we printed a story entitled, "How Precision Steel Balls Are Ground and Finished" by Joseph A. Weir, Abrasive Engineer, Carborundum Co. We are happy to send tear sheets.

More on Bearings

Would it be possible to obtain a free copy of "Job Shop Production Anti-Friction Bearings", GRINDING AND FINISHING, V. 5, Nov. 1959, p. 34-37?

This is to be used in conjunction with my college course entitled "Manufacturing Materials, Processes, and Techniques."

San Jose City College
James G. Babcock
Instructor

We are very happy to send copies of any articles which may be of service in the educational system.

Standard Time Data

Will you please send us tear sheets for Part I of "Standard Time Data for Grinding"? Thank you.

General Electric Company
Walter A. Gibson
Specialist - Process and Equipment Planning

We are glad to be able to send these tear sheets of individual parts as long as they last. The complete series will be available in about one month. These reprints will cost $1.00 each in orders of less than 25. Write for quantity price in lots over 25.

Flat Polishing

From a reader service card.

Have you reprints of articles re. buffing and polishing methods, their trends or technological development etc.

James Smith & Son, Inc.
W. Thurber
Engineer

We are sending a number of reprints which have appeared over the years in GRINDING AND FINISHING. We hope they will be of help.

More Flat Polishing

We would appreciate receiving tear sheets or reprints of the article: "Slash Costs with Flat Polishing" by Earl D. Hoskins appearing on pages 43-44-45 of January 1960 issue of GRINDING AND FINISHING.

Thanking you in advance.

Fabbrica Apparecchiature Per Comunicazioni Elettriche - Standard
C. Brusatori
Works Manager

Wheel Treatment

The January issue of GRINDING AND FINISHING explains a graphite grinding process. I would appreciate receiving six reprints of this article at your convenience.

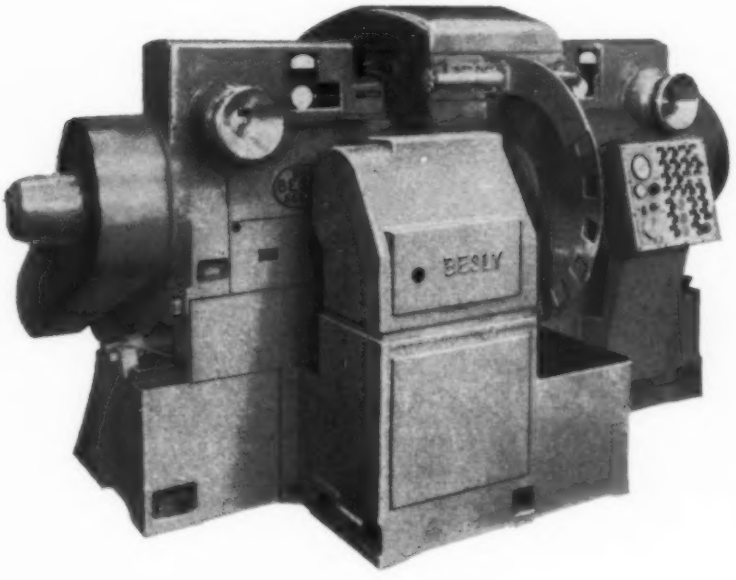
Abrasive Specialist
Stambaugh Supply
R. A. Kindig, Jr.

Only tear sheets are on hand at this time. We hope that reprints will be available in the near future.

Ground to ± .0001" of size!

A dense cast alloy PUMP RING, 2½" dia. x ⅛", finish-ground at 300 per hour by a BESLY DH4 grinder. It gaged out to ±.0001" and .000050" for flatness and parallelism. Stock removed was .0015". The ground faces checked out at 12 micro-inch finish.

If your grinding equipment can't turn out such results...**Better see Besly!**



BESLY DH4 double horizontal spindle disc grinder. Has *exclusive* precision quill and clutch infeed that provides feed increments calibrated in *millionths.* Abrasive discs can be changed in 30 minutes without disturbing setup, *cutting downtime in half.* Dressing time is only four minutes, *1/5 the usual time!* Simplified push-button operation and controls, built-in dials, gages and meters to indicate abrasive conditions, movement and alignment, motor load, etc., assure precise results, dependable grinding production.

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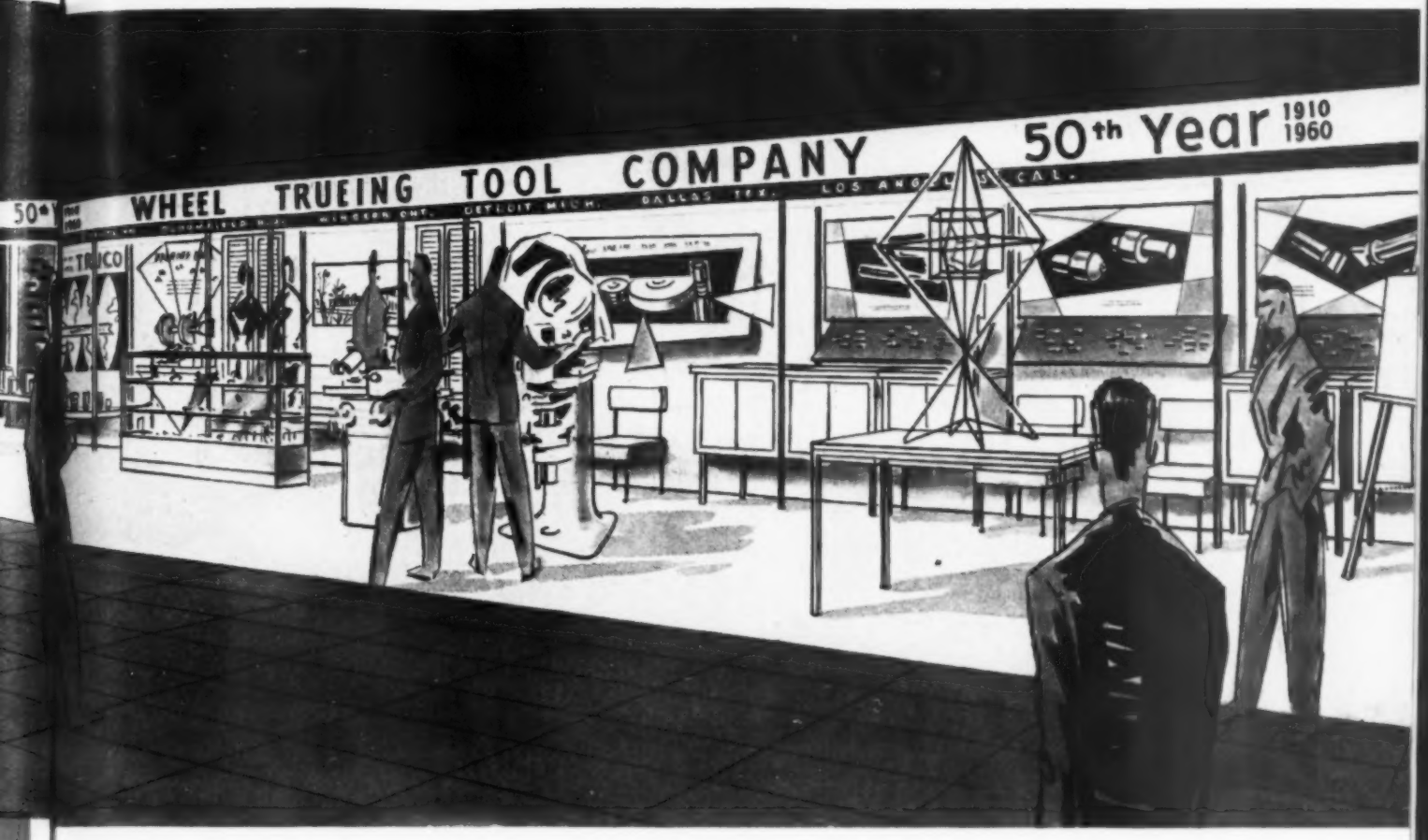

Practically every diamond tool in use today owes something to the fact that fifty years ago, some foresighted men started one of America's first diamond tool plants in a little home garage in Highland Park, Michigan.

The diamond tool of those days was a primitive thing—a diamond in a metal shank stuck into a handle. Performance was unpredictable; wastage and diamond loss great.

But, these men had come up through the abrasive wheel business and were convinced that, since abrasive wheels differed so much —in size, bond, type and size of grain, hardness, etc., it was only logical that diamond dressing tools should be different, too; in fact, the ideal tool would be *engineered to match the specific wheel and its work.* They even believed that such tools could be *guaranteed* to do their intended job.

It was a radical idea for those days; it meant endless research on factory production lines and in laboratories but, it worked. A steady progression of new ideas in diamond tools, new concepts of application and performance flowed from the garage workshop and from the plants that succeeded it, changed diamond-using habits and established an American diamond industry that is unsurpassed throughout the world.

This, we think, is an appropriate time to say "thank you" to our loyal customers and to the members of our company "family" who have made this growth possible and who, together, have brought us to our semi-centennial year.

Won't you visit us at Booth 338 ASTME Show where the highlight of a large display of diamond tools will be demonstrations of the remarkable new Tru-Grit® Rotary Diamond Dressing Wheel—a major breakthrough in high-speed precision forming and dressing, and the first showing of the Tru-Vec Diamond Tool with its X-ray Vectored Diamond. You'll have a profitable visit.

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Blanchard makes and stocks a great variety of silicate, resinoid and vitrified bonded wheels and segments. Ask your Blanchard representative to help you select the wheel – or wheels – best suited to your requirements. Call or write him today. And may we send you a copy of "The Art of Blanchard Surface Grinding" (4th Edition)?

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Editor's Page

APRIL 1960

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EVOLUTION OF METAL CUTTING

We are on the verge of a true evolution in the metalworking field. By 1970 or before, 50% or more of all metal cutting operations will be abrasive operations!

Abrasive operations, long an important factor in metalworking, has, since World War II, been steadily increasing in importance. In 1953 grinding machines represented 26% of the metal cutting machines sold. In 1954 and again in 1958 grinding machines exceeded lathes as the largest dollar volume export machines. In 1954, it was 13 million to 12 million while in 1958 it was 21 million to 16 million. Now in the latest Department of Commerce figures, grinding machines by quantity represented 42% of the metal cutting machines sold in the first two quarters of 1959.

This evolution is not an accident. There are three main reasons for this increase. First, the "space age" or "atomic age" or what ever you wish to call it has now greatly increased the requirements for close tolerances and fine finishes. Every increase in this direction, of course, places greater emphasis on abrasive operations. Second, the technical advance of abrasives, abrasive equipment has been greatly increased since the start of World War II. While the companies involved have taken tremendous steps in the last few years, it is amazing to find many metal removal seminars which only mention tool room grinding. Finally, societies in the industry have been extremely active. The Grinding Wheel Institute has taken a very strong roll in this advance. Abrasive Grain Association, American Standards Association, Coated Abrasive Manufacturers Institute on the corporate level and more recently the American Society for Abrasives on an individual level are some of the others who are helping this industry reach its proper position in the metalworking industry.

There is still one area not mentioned here, that is, the individual, the fellow who selects the process or method of machining. It will of course depend upon these people as to whether they are willing to make this change. The increase of quality, production and savings by abrasive operations are available for those who are willing to investigate. In the end, it will be up to you to apply abrasive operations to make this evolution take place.

M. M. Patterson

Managing Editor

"Even our standard stock wheel

Elden L. Auker, Vice President—Marketing of Bay State Abrasives, is a man who knows the industry through years of experience both in working in the field with Bay State customers and from close association with the research and development programs at Bay State's manufacturing headquarters in Westboro, Mass.

"There's only one thing in this business that gives me a bigger kick than seeing a new Bay State wheel specification turn out successfully. That's when one of our standard wheels goes into a series of tough tests and proves it has what it takes to beat the competition.

"That's what happened recently at Omaha Steel Works. They're one of the largest and most diversified processors of structural steel, weldments and steel castings in the entire Western area of the U.S. . . . and, believe me, they are test-minded.

"As our own Abrasive Specialist, Gene Miller, says: 'This was one time when sales talk was strictly *verboten*. They wanted the best wheel they could get for finish-grinding steel castings and they asked all the major abrasives manufacturers for wheels to test. And, did they give them a going over! There wasn't anything they didn't check. The results showed our stock specifiication beat out all wheels in cutting speed and length of life so it cut their cost-per-hour figures and naturally reduced down-time for wheel changes, too.'

"Well, there's one example. But there are plenty of others. And they all prove the importance of *testing* . . . even testing wheels that are doing a perfectly acceptable job . . . because we may well have a standard stock wheel that could do a whole lot *better* job. In your tool room, for example, or on the production line, put your Bay State distributor or our direct representative on the trail and you could quite possibly wind up with substantially improved performance and cost figures just by switching to a standard Bay State wheel, straight out of inventory. Our people will cooperate in any tests you want to set up because . . . *better grinding at lower cost . . . that is their business.*

beat out all competition at OMAHA STEEL WORKS"

Right) Chief Inspector Lloyd Base and Bay State Abrasive Specialist Gene Miller examine results achieved with Bay State finish-grinding wheel.

Below) Operator Vincent Munsinger finish-grinds steel track-carrier casting with Bay State's 6 x ¾ x ⅝ wheel on a portable air grinder. "This wheel cuts fast and I don't have to change wheels too often," says Munsinger.

Safety guard removed for photography)

BAY STATE ABRASIVES

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Bay State Abrasive Products Co., Westboro, Massachusetts.
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- CUT-OFF WHEELS
- DIAMOND WHEELS
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- *NEW* FAST CUT MOLDISCS
- *NEW* LONG-LIFE MOLDISCS
- *NEW* SNAGGING WHEELS FOR AUTOMATIC BILLET GRINDING

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You Can Get a Manhattan Abrasive Wheel Custom-Designed for Any of These Jobs.

Foundry Snagging—Billet Surfacing
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Bearing Race Grinding and Finishing
Finishing Tools and Cutlery

Cutting-off—Wet or Dry—Bars, Tubing, Structurals, etc.
Foundry Cutting—Standard and Reinforced Wheels
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ABRASIVE, GRAIN SIZE, HARDNESS, STRUCTURE, BOND—EVERY WHEEL COMPONENT IS SELECTED FOR YOUR CUTTING AND GRINDING REQUIREMENTS. SEE YOUR MANHATTAN ABRASIVE WHEEL SPECIALIST.

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"MORE USE PER DOLLAR"

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American Society for Abrasives

Pittsburgh Chapter Welcomes National Convention

Frank B. Rackley, president of Jessop Steel Company, Washington, Pennsylvania, is scheduled as the featured speaker at the evening banquet highlighting this year's national convention at Pittsburgh, Saturday, April 9.

The afternoon session will consist of a panel discussion on the evaluation of billet grinding wheels, one of the hottest subjects in the field of abrasives today.

With **John Y. Arnold**, national president, as moderator, the following will make up the panel: **C. G. Beattie**, of Allegheny Ludlum; **E. R. Daniels**, of Universal-Cyclops; **J. Patton**, of Crucible Steel; **L. Sealy**, of Bay State; and **J. E. Price**, of Simonds Abrasive.

Price, incidentally, is the author of this month's cover story (see page 34) and Daniels supervised the in-plant testing of a new Mid-West automatic billet grinder (see page 39).

The morning session, following registration of the delegates at 9:30, will be devoted to the annual business meeting of the society. Featuring this part of the program will be reports of the national chairman, the president and the treasurer, together with the report of the nominating committee. Two directors to serve for five-year terms, one to serve for two years, and an auditor are to be chosen.

Representatives of associate member companies will get together at 9:30 Sunday morning for a breakfast meeting, closing out the convention activities.

All members of the society are encouraged to attend the convention. Voting rights, however, are restricted to certified delegates.

Flint Chapter

Walter Burkart, assistant manager of the Machine Tool Division, The Sheffield Corporation, Dayton, Ohio, spoke on "Crush Form Grinding" at the March meeting held at the McNeven Hotel, Frankenmuth, Michigan.

Following the program, consideration was given to changing the name of the chapter from "Flint" to "Saginaw Valley," to recognize the area rather than any one city.

Another decision was made to offer a prize to the winner of one on the local Science Fairs, rather than to sponsor a scholarship.

With representatives of both Detroit and Western Michigan chapters present, the possibilities of joint meetings of the three chapters and the coordination of their programs and projects was also explored.

New Jersey Chapter

Like "My Fair Lady," the GE-Carborundum program on the development and application of man-made diamonds continues to pack them in. In a repeat performance for the New Jersey chapter, the discussion drew an attendance of 67 members and guests, ten more than the registered membership of the chapter at the end of 1959.

E. L. Kapernaros, application development engineer, represented General Electric, while **J. A. Mueller**, grinding lab manager, and **J. W. Ripple**, manager, diamond products, Bonded Abrasives Division, spoke for The Carborundum Company.

Chicago Chapter

Albert L. Ball, technical consultant for Bay State Abrasive Products Co., Westboro, Mass., discussed "The Nature and Function of Abrasive Bonds" at the March meeting of the Chicago chapter. For once, the weather was favorable, and the attendance reflected the improvement. A film, "Prescription for Grinding," was also shown.

Albert L. Ball

"Manufacture and Processing of Fused Aluminum Oxide and Silicon Carbide Abrasive Grains" will be the title of a talk by **George L. Cornwell**, director of research, The Exolon Company, Tonawanda, N.Y., at the April meeting of the Chicago chapter, to be held April 14 at Neilsen's Restaurant, North Ave.

The talk will cover the electrical furnacing of both abrasives, processing and treating, and production and quality control.

Long Island Chapter

"Tool and Cutter Grinding" was the subject for the March chapter meeting, with **Phillip Thomas**, manager, precision products department, The Carborundum Company, Niagara Falls, New York, as the speaker.

The meeting was held at Wheatley Hills Tavern, Westbury, New York, on Wednesday, March 9, 1960.

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First select the style you need from Elgin's *complete* line of diamond wheels, then the Elgin man will help you specify the very best bond, grit, concentration, hardness and bond modification—and tell you whether to use *natural* or *man-made* diamonds.

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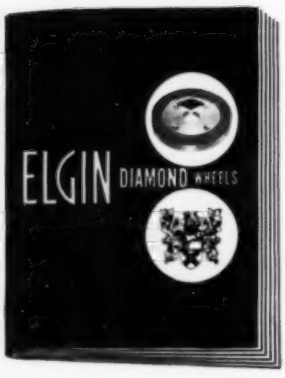

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Officers of the chapter for 1960 are: president, **C. Honor**, of J. Soehner & Sons, moving up from recording secretary; vice president, **W. Soehner**, from the same firm; recording secretary, **P. Krop**, of K & K Grinding. Continuing as corresponding secretary and treasurer, respectively, are **H. Golden**, Kappel & Mazur, and **J. Urgo**, Di-Tru Diamond Tool Co.

Connecticut Chapter

The Connecticut chapter, led by speaker **T. E. Martin** of the Stewart Instrument Co., discussed the "Productive Time and Energy Analyser" at the January meeting. Martin showed the group, with the aid of slides, how the analyser is used extensively for grinding wheel testing, machine utilization studies and for the setting of work standards. Also discussed were the "Workometer," used for continued measurement of the amount of work that workers get out of their machines, and the "Work Standard Analyser," designed for making correct and accurate studies for setting work standards based on a measured amount of machine work.

Hudson-Mohawk Chapter

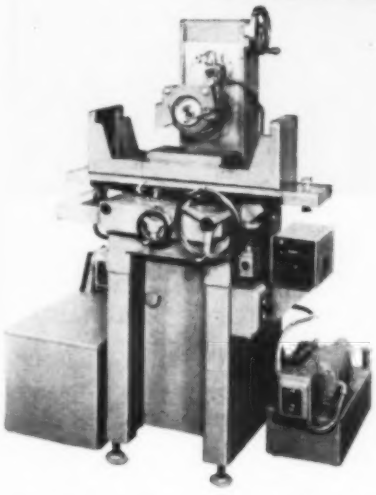
The Hudson-Mohawk chapter played host at its January meeting to three speakers: **W. Cole, R. Pugh** and **K. Reece,** field representatives of the Grinding Division of the Cincinnati Milling Machine Co. Movies were shown on the Filmatic Spindle, the construction of grinding machines and on coolants. Working models of the Filmatic Spindle and wheel balancing components were also available for inspection. Following the films Messrs. Cole, Pugh and Reece conducted a question and answer session.

MEMBERSHIP STANDINGS

Total membership in the chapters of the Society, as reported to National Headquarters as of January 31, 1960, is as follows:

Connecticut	142 members
Detroit	100 members
Pittsburgh	88 members
Delaware Valley	65 members
Chicago	64 membres
Reading	60 members
New Jersey	57 members
Long Island	47 members
Boston	42 members
Hudson-Mohawk	37 members
Flint	35 members
West. Michigan	34 members
West. Mass.	27 members

See the DoALL Exhibit in Booth 1226 ASTE Tool Show



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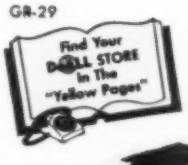
The operator can quickly "fit" this grinder to himself. Machine height is adjustable. Table handwheel is easily moved from left to right side of saddle and its position adjusted radially for greatest convenience. These are a few operating features that increase operator productivity.

Complete line of attachments, such as "Cool Grind" coolant system, hydraulic table control and many others, can be purchased with machine or added in your plant. Before you buy any surface grinder, see the model DH-612. Ask your DoALL Sales-Service Store to demonstrate.

GR-29



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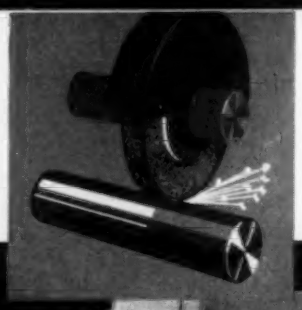

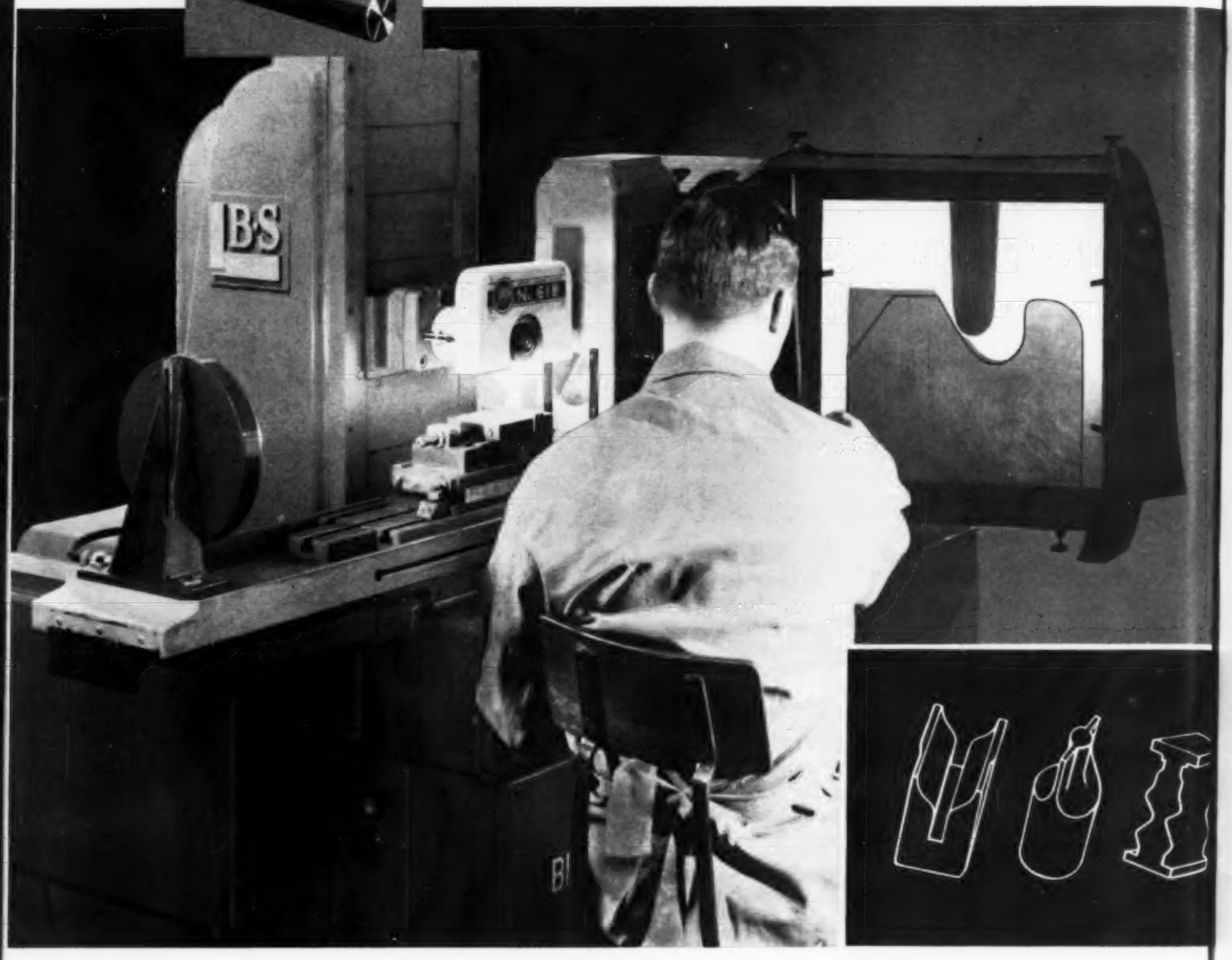

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VISUAL GRIND, the built-in comparator on the B&S 618 Surface Grinding Machine, permits tool and die makers to meet today's demand for intricate shapes in super-hard materials with spectacular savings in work hours and wheel costs.

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THE VISUAL GRIND® system is manufactured by The Cleveland Grinding Machine Co. and is sold only by Brown & Sharpe. For details, write: Machine Tool Division, Brown & Sharpe Mfg. Co., Providence 1, R. I.

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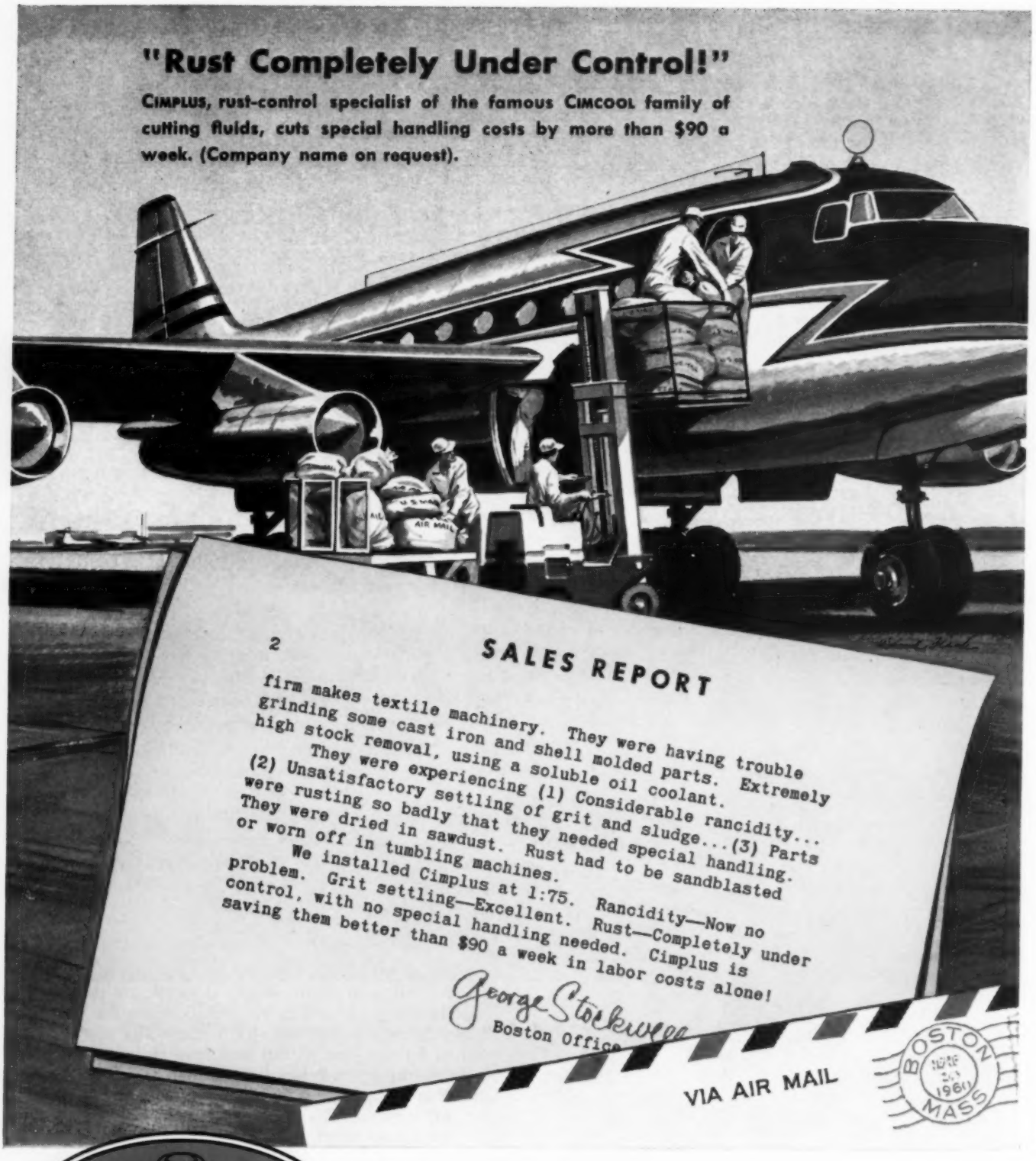
2
SALES REPORT
firm makes textile machinery. They were having trouble grinding some cast iron and shell molded parts. Extremely high stock removal, using a soluble oil coolant.
They were experiencing (1) Considerable rancidity... (2) Unsatisfactory settling of grit and sludge...(3) Parts were rusting so badly that they needed special handling. They were dried in sawdust. Rust had to be sandblasted or worn off in tumbling machines.
We installed Cimplus at 1:75. Rancidity—Now no problem. Grit settling—Excellent. Rust—Completely under control, with no special handling needed. Cimplus is saving them better than $90 a week in labor costs alone!
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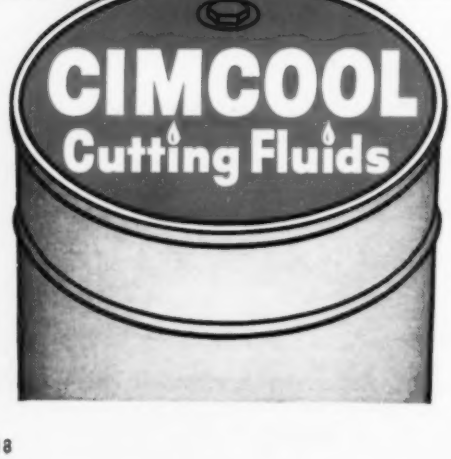

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For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

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You Asked . . .

ARTHUR RAKESTRAW • Contributing Editor

Regrinding End Mills

• It seems that when we receive end mills from a vendor we get normal tool life, but after one grind the tool life drops to below 50% of normal. What would we gain by using a coolant when the cutter is being ground? One vendor told me that they use mist to grind their cutters at the factory.—W. D., Windsor Locks, Connecticut.

Difficulties such as you have experienced are not uncommon and we have encountered them many times. Loss of production from tools after regrinding could result from errors in maintaining the original tool angles, or possibly from the use of abrasive wheels much too hard for the operation.

Whether or not a cutting tool should be ground dry or with a coolant depends largely on the size of the tool and the amount of grinding required.

You have no doubt observed that many tool grinders are not equipped for wet grinding, for the reason that the resharpening performed on these machines is not severe enough to generate objectionable heat. The addition of a coolant would cut down visibility, making it increasingly difficult for the operator to position the cutter edge.

It is quite possible that your difficulty may result from the method of regrinding in use. Occasionally the operator will locate a chipped or badly worn cutter edge and proceed to grind out the imperfection down to finish. Without backing off the grinding wheel, he may elect to grind down the remaining cutter edges. It is obvious that even though the grinding passes were made very slowly, the excessively heavy cut would generate objectionable heat. Even a coolant would not eliminate the possibility of softening the cutting edge, although it might dissipate the heat.

Regardless of the amount of stock to be removed in resharpening cutters and the number of revolutions of the cutter, wheel infeed should not be excessive.

Spray mist is an excellent coolant medium, particularly on such operations as tool resharpening. Visibility of the operator should not be impaired. No reservoir for spent coolant is required, as the mist is drawn into the exhaust system.

After you have checked into the method of tool resharpening, grinding wheel specification, and cutter angles, if in your opinion the addition of spray mist would add further worth for protecting and restoring lost tool life, we certainly would suggest you try it.

Wheel Reinforcements

• Does a prong nut bushing hold a cup wheel better than reinforcing rings hold a snagging wheel? If so, what is the reason?—A. G., Steelton, Pa.

Probably in the research files of the grinding wheel manufacturers or of some outside testing laboratory there is data as to the comparative operating strengths of the two reinforcing methods. We are not familiar with this material, however.

Of course, reinforcing rings or molded-in flanges are about the only known methods of adding strength to large-hole snagging wheels. Considerable research has been involved in the design, the rod size and the number of rings in a given abrasive section. Too many or too large rings would have a tendency to weaken, rather than to strengthen, a given wheel section.

Small portable wheels, particularly cups, often have threaded, pronged nuts molded into the wheel. Although the design is not universal, some manufacturers have incorporated reinforcing rings into the wheel design, hoping to add to the safety factor of the wheel.

The effectiveness of this design might be questioned because of the comparatively thin rim and back sections. Portable cup wheels can also be further protected by the use of cup guards, either molded into the wheel or mounted on the spindle with the wheel and revolving with it.

Grinding wheel manufacturers have devoted considerable research to the problems of safety in the use of their products. At present reinforcing rings appear to be the best answer for snagging wheels. The picture is not so clear for portable cup wheels, where a number of methods are in use.

As to which of the methods you mentioned is the stronger, there is no pat answer. Each is good in its field.

For further discussion of portable wheel reinforcements, see "The Case for 'Built-In-Guard' Cup Wheels," GRINDING and FINISHING, March, 1959, page 40.

Pressure for Grinding Tungsten Carbide

• What is the optimum pressure for grinding tungsten carbide with resinoid bonded diamond wheels, to insure maximum production and minimum wheel wear?—V. M., Berkley, Michigan.

If you have reference to the actual pounds pressure as applied by pressing the carbide tool against the face of a diamond wheel, I am not aware that any such data has been recorded.

I do believe, however, that the allowable pressure would be closely associated with the available power in the motor drive. For instance, if sufficient pressure is applied to result in a slowing down of the wheel rotation, you have exceeded the optimum.

In terms of infeed, the amount should not exceed 25% of the diamond particle size. Heavier infeeds result in rolling the diamond grit out of the bond mass. • • •

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New Cooltex keeps machines cleaner, lets dirt and grit settle out faster. This means *freer, cooler grinding—without heat checks*—for smoother finishes. With Cooltex, wheels last longer, and you can even use a finer grit! Your Texaco Lube Engineer is sending out Cooltex reminder postcards. Watch for yours. Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

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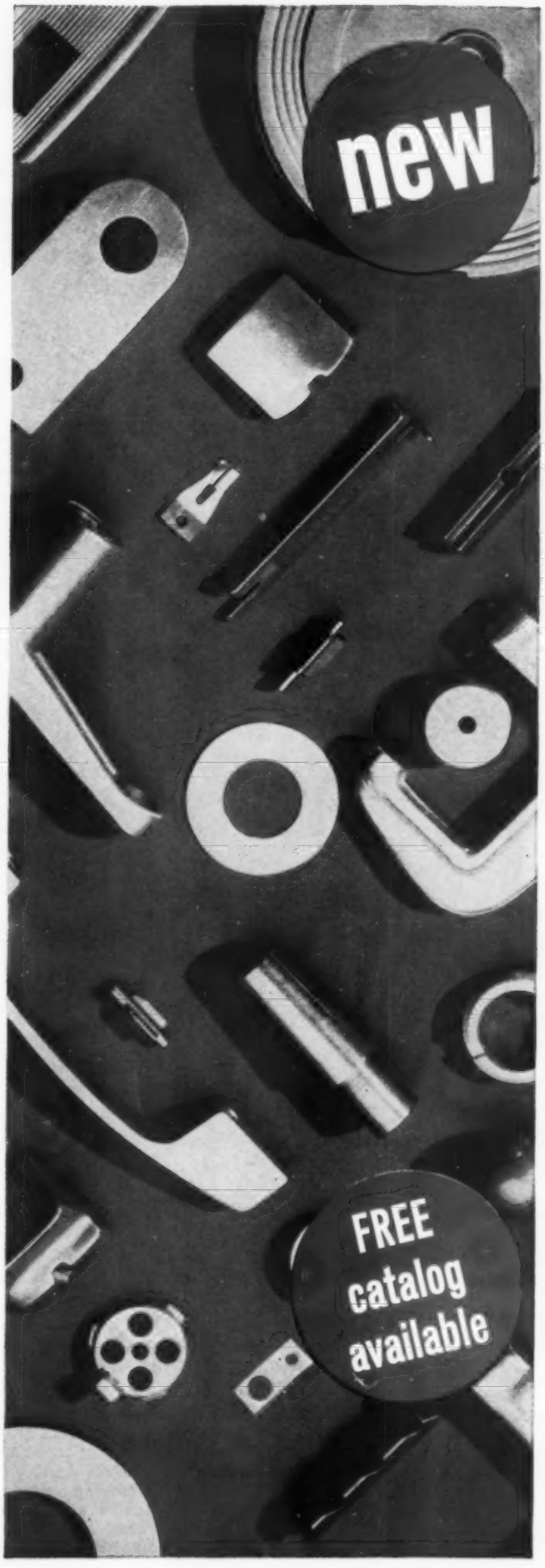

process for positive, low-cost deburring, grinding, polishing, burnishing, radii-forming, cleaning, descaling, rust removal, stress relief, low micro-inch finishing, and surface hardening of metal parts...

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■ Here is the kind of efficiency that cost-conscious manufacturers expect—*and get*—from Acme. This reputation for excellence in a very specialized field has been earned during 50 years of leadership in solving deburring, polishing, and buffing problems for a wide variety of manufacturers, large and small. Building hardware, automotive trim, electrical and plumbing fixtures, household appliances and kitchenware, primary metal sheets and coils—these are some of the many mass-produced parts now served efficiently by Acme machines.

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RICHARD L. McKEE • Associate Editor

Grinding Threads in Rough Parts

Oakland firm finds thread grinding superior in economy, quality for threading bridge pins of 1020 steel.

● Thread grinding, precision threads, and hardened materials are generally regarded as one of the eternal triangles of metalworking.

In other words, you grind threads whenever the tolerances, the finish, or the material keeps you from doing the job some other way. Ask most process engineers how they would thread bridge pins of 1020 steel, four inches in diameter, with a special three-inch diameter, 6 pitch thread on each end, and chances are you'd be told, "Thread it on a lathe with a single tool."

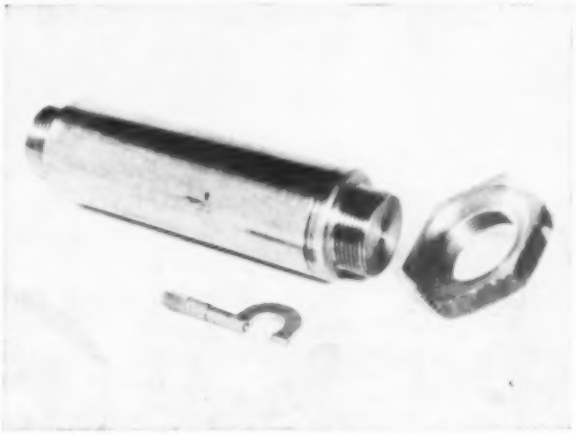
This answer, however, didn't satisfy Horspool & Romine, an Oakland, California, shop, when they faced such a problem in connection with a large-scale construction job in San Francisco. Grinding specialists, they use other methods only when grinding definitely does not apply.

After the ends of the pins had been turned and centered in the conventional manner, the special threads were ground on a heavy duty Ex-Cell-O thread grinder, using 18" resin-bonded 80-grit aluminum oxide thread grinding wheels. While direct comparisons with single point threading were not possible, since this was not a repetitive, long-run production job, the results were found to be superior from the standpoint of economy as well as of quality.

The use of a die head for a job such as this was considered, but was rejected due to the special thread, the cost of setting up for the short run involved, and the necessity for threading up close to the shoulder.

The internal threads on the nuts were not ground, but tapped with a special tap ground at the same time as the threads—an additional economy. The tap was a special design of Horspool & Romine which permitted the use of this method in internal threading from 3" to 6" where formerly most jobs were single-tooled because of high tap costs.

With the success of this initial venture into the field of heavy industry, Ernest H. Romine, general manager of the Oakland firm, predicts the extension of applications of precision thread grinding to lower costs of industrial component parts with large diameter threads. • • •



Four-inch diameter bridge pin of 1020 steel, with a three-inch, 6 pitch thread on either end, together with one of the nuts. Grinding the threads on either end of the pin proved to be both more economical and of better quality than work threaded in the conventional manner.

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Multi-Point, Multi-Set, and Single Point Wheel Dressing Tools.

Multi-Cut Dressing Tools for Profile Grinding.

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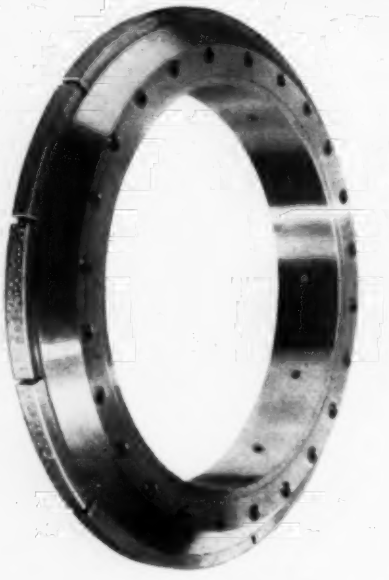
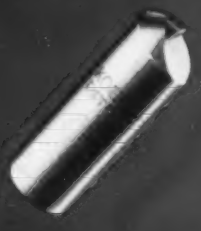
Dia-Pak Coring Bits for Exploratory and Concrete Drilling.



Shaped CDP Cutter for Grinding Hard-Fired Ceramics and Super Hard Alloys. CDP Precision Drills (from .020" Dia. up) for these materials are available in solid and coring types.

Round and Blade Type CDP Dressing Tools.



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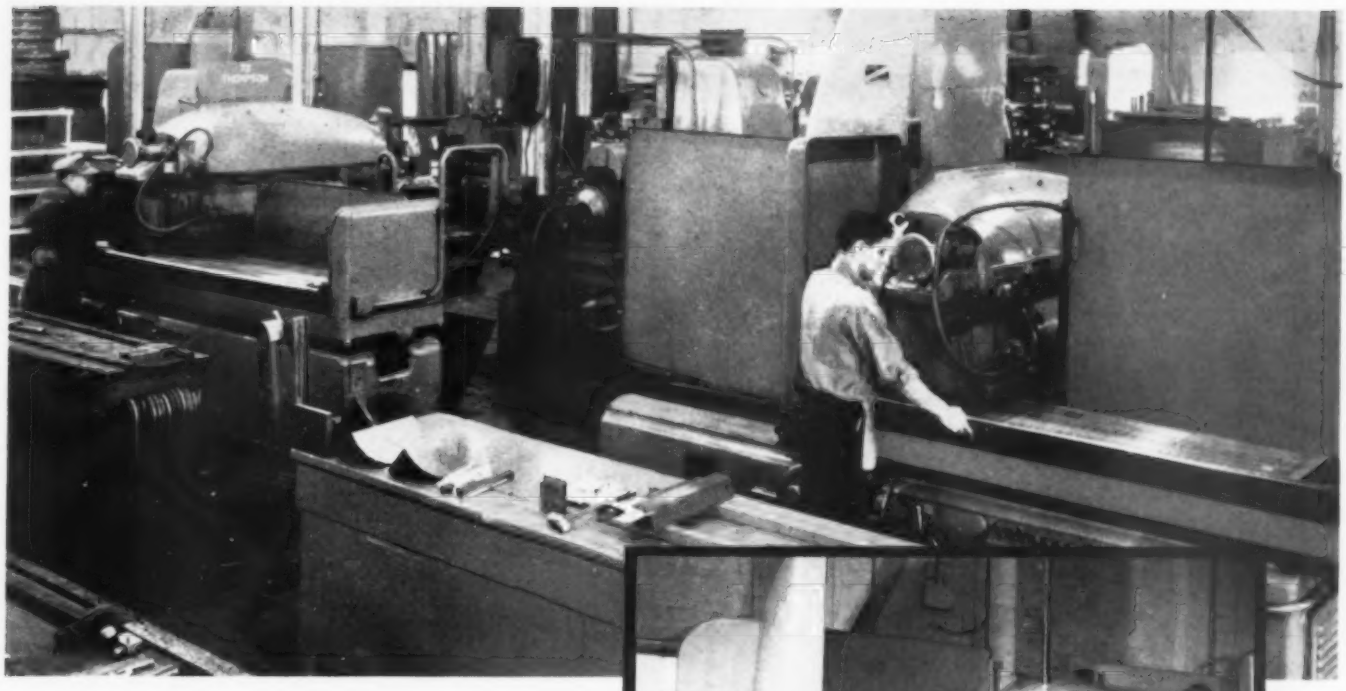
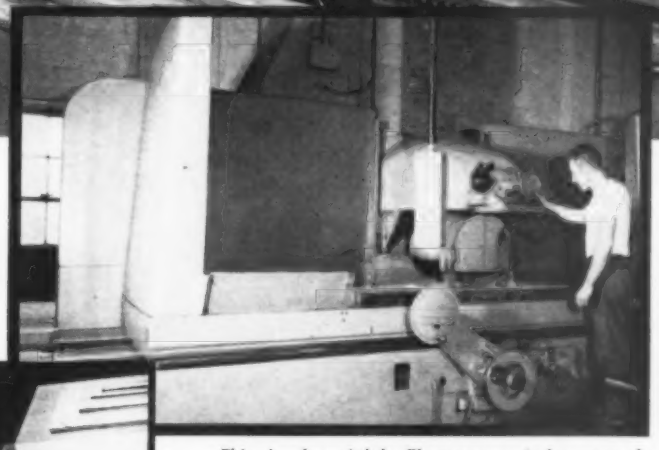
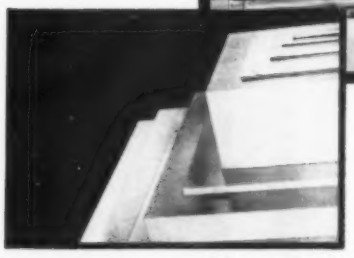


A ROOMFUL of THOMPSON GRINDERS



This is the eighth Thompson grinder recently installed at Jessop which grinds plates and sheets up to 60" × 96" in size.



Jessop precision ground flat stock which is used in gages, dies, verniers and other exacting products.

Pictured above are 4 Thompson Grinders in the Specialties Division of Jessop Steel Company, Washington, Pennsylvania. There are 4 more Thompsons which are not shown in the above photo. All these Thompson machines are grinding to the extremely accurate tolerances and fine RMS finishes that distinguish Jessop's precision ground flat stock.

There are excellent reasons for using 8 Thompsons on this essential production. Mr. Joseph Manfredi, who is responsible for the quality and production of this famous ground flat stock, says, **"We have recently installed our eighth Thompson grinder in this division. We have proven the top performance of these rugged machines for many years. They give us the extreme accuracy and precision we demand—day after day with a minimum of maintenance."**

You may not need 8 Thompson grinders in your operations but it will pay you well to investigate what just one Thompson machine can do toward saving time, improving your products and cutting your costs of manufacture.

Your inquiries are invited.

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Thor No. 5 series heavy duty air grinders. Safest grinders ever built. 100% increase in power at no increase in weight. Remove far more metal in far less time. Positive safety control, in addition to standard governor, absolutely prevents "run-away" tools. If governor fails, air supply is cut off. Weight 10 lbs. Grip, lever or butterfly throttle. 4,500 and 6,000 r.p.m. grinding speeds.

Thor has a complete range of air grinder sizes and models. There's a Thor grinder to fit any metal removing or finishing problem. Your Thor factory representative or distributor will demonstrate. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

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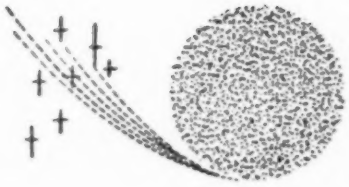


Ideas from the Shop

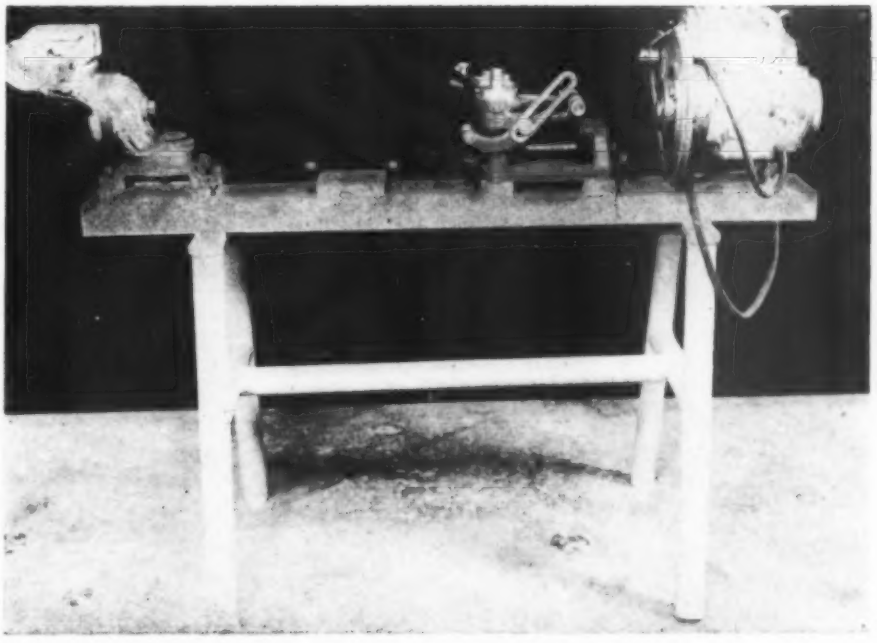
Accessory Rack For Tool And Cutter Grinder

By H. J. Gerber

• The illustrated floor stand was built for the storage of bulky accessory units for our tool and cutter grinding machine. The rack is kept near the machine and provides convenient and orderly storage as well as minimizing the possibility that these attachments will be accidentally pushed off onto the concrete floor.

The rack is made from a section of 6" steel channel welded to pipe legs. A fitted wood pad or nest is provided for each unit. Retaining bolts are welded to the channel to permit locking the units in place.

A canvas drop cloth is placed over this storage rack to keep the accessories free from abrasive grit and dust.



Custom-built stand for bulky accessories provides safe storage.

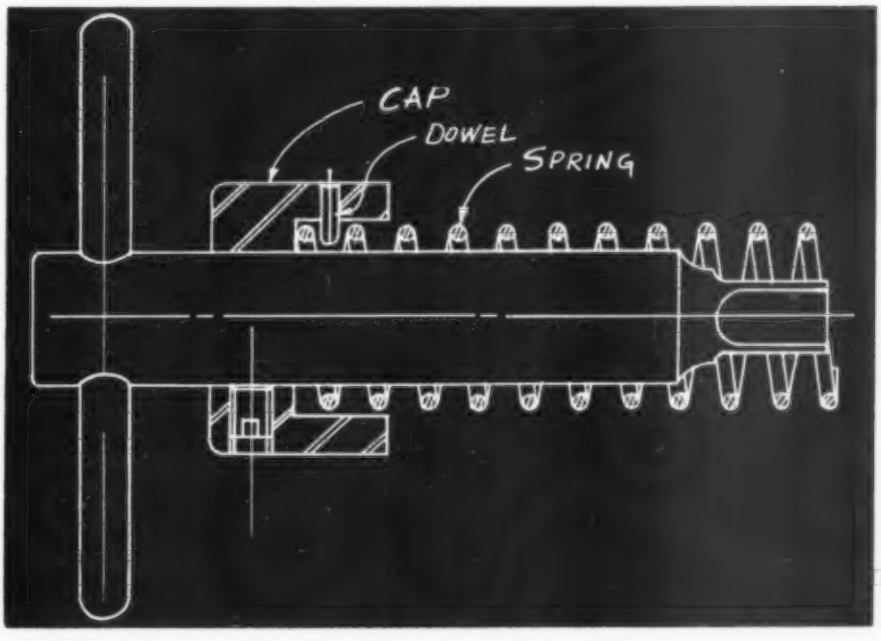
Chuck Wrench with Safety Device

By Cliff Bossmann

• In many tool shops, injury to a lathe hand has occurred when a chuck wrench has absentmindedly been left in the chuck.

Shown in the sketch is a very simple yet effective safety device which may easily be added to chuck wrenches of all sizes and descriptions. It comprises a cap which retains a spring through the use of a dowel pin as shown. The cap is retained by a socket set screw. When the wrench is used, it is necessary to compress the spring prior to positioning the wrench end in the chuck body. When the chuck has been tightened, it is impossible to leave the wrench in place because the spring will force it out of the chuck body.

Many tool shops have adopted this easily built device, the result being a noticeable decrease in accidents when chucking is involved. • • •



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Look at quality. Cortland mounted wheels and points are made of the very best materials available. Due to Cortland's unique manufacturing process, controlled by experts in this specialty line, you naturally get unsurpassed performance.

Look at your cost. This combination price and stock list illustrates all standard shapes of mounted points and wheels. It lists over 200 vitrified bonded stock items in various sizes, shapes and specifications. These standard stock items *may be purchased under a special combining privilege* with prices based on the total quantity ordered in different dimensions and specifications, provided the minimum quantity for each item is at least 25.

The standard stock list is being constantly expanded. For information on latest additions please contact your local Cortland representative or the home office.

• • •

Cortland points are also available in resinoid bonds and in the laminated Cortex type. These would be manufactured to order and priced under the regular schedule. 29

Cortland points are packaged in telescope red boxes, labeled clearly — easy to store and locate quickly.

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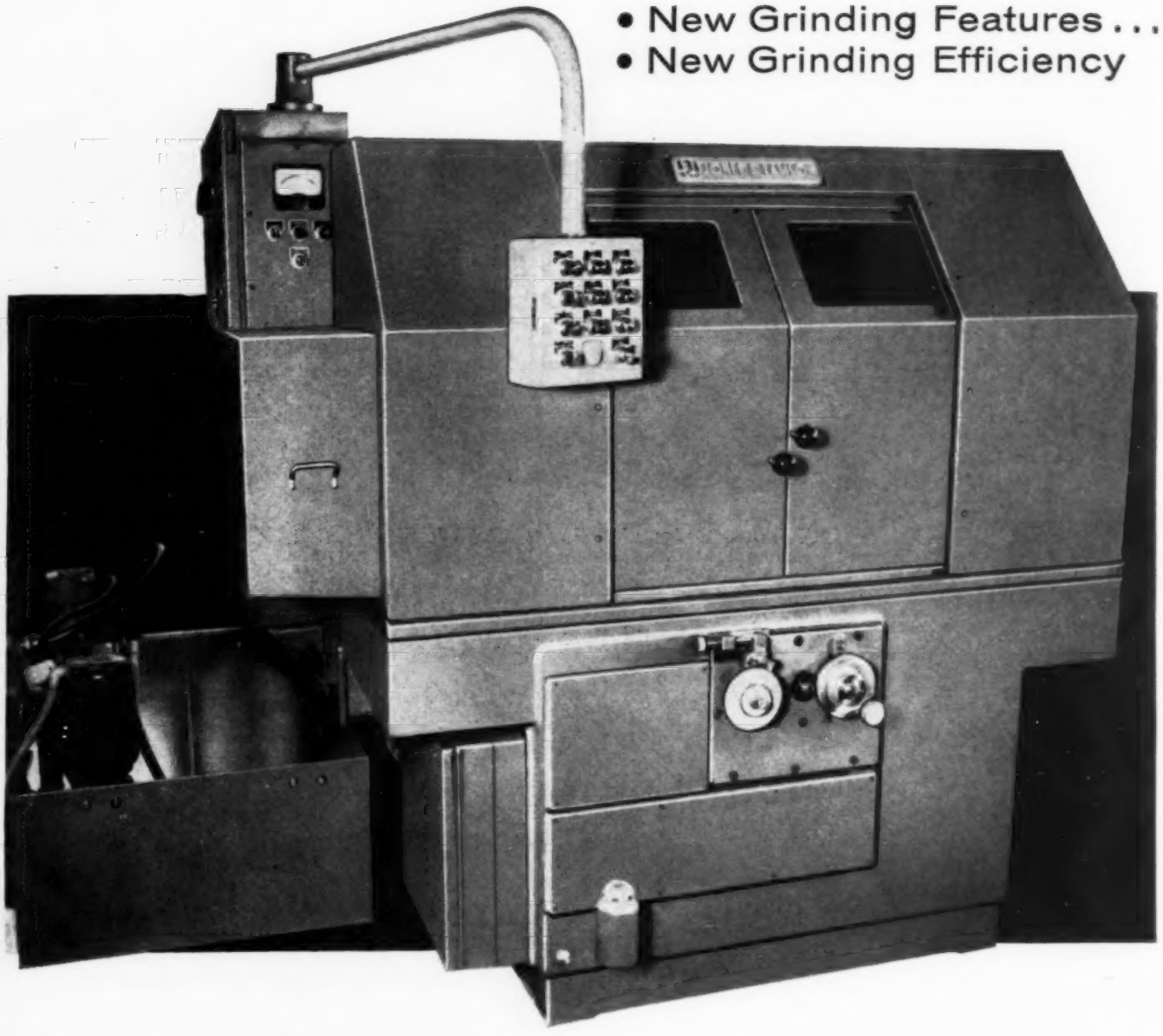

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Pre-grinding operations are eliminated . . . Speed and ease of set-up reduces downtime.

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Higher production per machine and per worker and elimination of "rough grinding" time means that fewer grinders and fewer workers are required to maintain existing production requirements.

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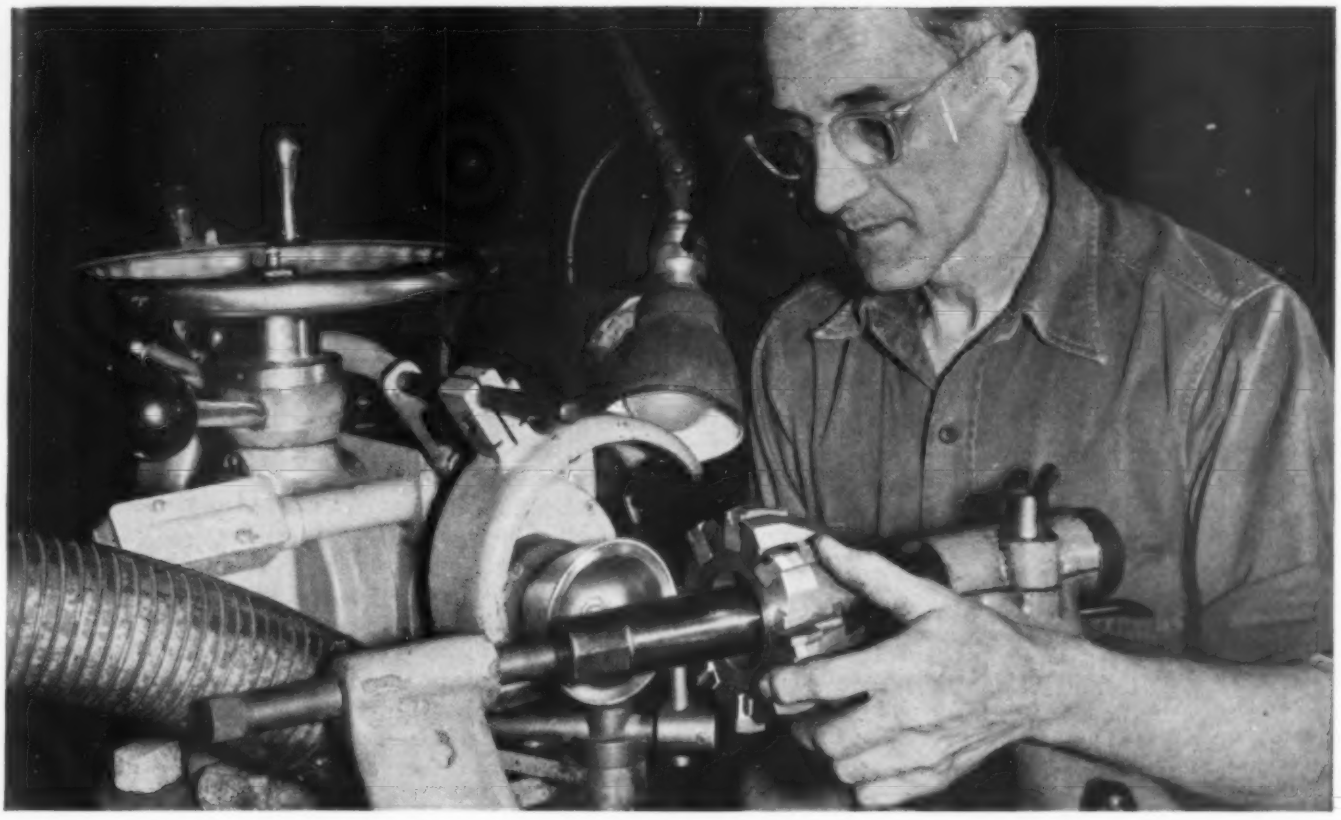
Why General Electric Man-Made diamonds are better for you

Multiply output per grinding wheel with G-E Man-Made diamonds



Diamond wheel users report that General Electric Man-Made diamonds increase production-per-wheel; reduce costs!

Right! You *can* multiply output per grinding wheel with wheels containing General Electric Man-Made industrial diamonds.

General Electric Man-Made diamonds are of controlled, uniform structure, shape and quality. Wheels containing G-E Man-Made diamonds give you longer wheel life, lower grinding cost per piece, and consistent superior performance.

And, General Electric Man-Made diamonds – with optimum friability and shape – can multiply the output of your grinding wheels in all resinoid and vitrified grinding applications. Everything from carbide burr grinding to the grinding of carbide and steel mixtures (even up to 50-50 ratios!).

Wheels containing G-E Man-Made diamonds (Type RVG) are readily available for every resinoid and vitrified grinding operation. Check with your supplier. Or write: *Metallurgical Products Department of General Electric Company, 11177 E. 8 Mile Street, Detroit 32, Michigan.*

THE PROOF IS IN YOUR PLANT!

An automobile manufacturer in a tool and cutter grinding application used 5" x 1¾" x 1¼" flaring cup wheels, resinoid bond, 100 concentration, 100 grit – dry grinding. Man-Made diamond wheel turned out 1217 cutters – and still had one-third of the wheel left! Natural diamond wheel produced only 696 cutters – a superiority of 162%, Man-Made over natural!

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DO HOT PRESSED WHEELS MEAN HIGHER SPEEDS?

Higher speeds have long been accepted as having greater efficiency than lower speeds. There have always been safety rules which were developed to control use of wheels in order to protect the user from the slightest possibility of injury. The hot pressed snagging wheels described here have indicated greatly increased savings and safety at speeds of 12,300 sfpm.

J. E. PRICE, Research Manager
Simonds Abrasive Company
Philadelphia, Penna.

● Significance of testing hot pressed snagging wheels both in the laboratory and at Sharon Steel Corp. is threefold. First, by the use of higher operating speeds, considerable improvement in operating efficiency was made possible. Second, hot pressed snagging wheels by reason of their increased strength are designed to meet these needs. Finally, extreme care is necessary to assure adequate precautions are made to meet the new and tougher requirements of automatic swing grinding at higher speeds.

In the writer's opinion, the results of the tests indicate that hot pressed wheels meet the new requirements of greater efficiency with greater safety and should, therefore, show increased usage in any mills where automatic swing grinders are used and cost is an important consideration.

Unfortunately, the grinding wheel industry suffers from a lack of published information regarding the background for its present wheel speeds. To be sure, the maximum allowable speeds have been aligned with strength characteristics of the bonded product. However, even here, we find discrepancies that bear no relationship to the true strength—if we mean by true strength, tensile or compressive strengths. It is no trick at all for any grinding wheel manufacturer to produce a vitrified bonded wheel with tensile or compressive strength equal to a resin bonded product. Yet all producers know, and field experience bears this out, that running vitrified wheels at resin speeds can and does cause breakage. This discrepancy means that the strength alone is not the only factor which governs choice of wheel speeds.

All this aside, why has the industry adopted a speed of 9,500 s.f.p.m. as a maximum operating speed for resin bonded wheels? Although the literature contains little on this, it can be reasoned that this choice was probably based on 2 factors. First, that 9,500 s.f.p.m. was the highest safe operating speed based on adequate safety factors and products produced when rules were made. Second, that choice of this maximum speed was based on information that the faster a wheel could be run, the better it would perform as far as efficiency and cut rate were concerned. A word of interest, here, is that the so-called upper limit of 9,500 s.f.p.m. is not sacrosanct even today. Cut-off wheels, for instance, are normally operated at speeds up to 16,000 s.f.p.m. Apparently wheel use and field operations are such that these higher speeds are satisfactory in spite of the fact that the binders are quite similar for both resin bonded cut-off wheels and snagging wheels. Therefore, we have adequate information to believe that higher speeds could be of value if they were practical and safe.

Although it is considered similar to surface grinding operations, the swing grinding equipment, whether automatic or manual, has several interesting characteristics that would considerably affect the pattern in grinding as a result of wheel and work speed changes. For instance, in normal surface grinding operations, since both the wheel and the work are held rigidly in a fixed relation to one another with a set down feed, the effect of changes in wheel speed and work speed are as follows:—

(a) *Increased wheel speed*—decreases grain depth of cut, and makes the wheel act harder.

TABLE 1

S.F.P.M.	Cord Length	Arc of Contact	Cross Sectional Area of Cut	Time in Cut per Revolution	Over-all % Time in Cut	Work Traverse Work	Wheel Spec.
6,331	.565"	8.436°	.0037 sq. in.	.00044 sec.	2.34%	10 s.f.p.m.	Coarse Hard Grain H.P.
8,743	.640"	9.758°	.0059 sq. in.	.000373 sec.	2.71%	10 s.f.p.m.	Coarse Hard Grain H.P.

(b) *Decrease of the work speed*—decreases the grain depth of cut, and makes the wheel appear to act harder also.

On a swing grinding operation, these rules do not hold because the wheel is free to move with relation to the work to the extent that it can select its own depth of cut.

Experiments in our own grinding laboratory showed a definite increase in depth of cut, and increased arc of contact occurred with increasing wheel speed. This, of course, was accompanied with constant work speed and other conditions of operations such as pressure.

We experimented with standard and reduced speeds since it was not possible to operate our equipment at higher wheel speeds. Thus, the changes we noted were those occurring between 6,331 s.f.p.m.—8,743 s.f.p.m. using a test wheel 1" wide, 7.68" diameter and 175 lbs. pressure on a 304 stainless steel billet.

Figure 1 shows a replica of the grinding pattern and our method of measurement of the arc of contact by means of the cord length at the 2 wheel speeds tested.

This experiment clearly shows that increasing the wheel speed would also increase the arc of contact and, therefore, the depth of cut. In addition, changes in the work speed at constant wheel speed also resulted in a change of depth of cut. In this case, the depth of cut increased as the work speed was reduced.

Thus, we have an indication that in swing grinding operations, we have entirely different patterns as far as work and wheel speed are concerned. We indicated that the increase of wheel speed should increase the depth of cut—if the work speed were held constant. Depth of cut was also increased—if work speed was decreased. Thus, the 2 rules cited for surface grinding do not hold, in fact, the opposite is true.

On the other hand, it is not clear how this increased wheel speed will affect the heating conditions of the wheel during the grinding operations. Since these conditions are important, not only for safety but for wheel efficiency as well, they will be studied further in the near future. From Table 1, it appears that the effect of increased wheel speed would be to decrease radically the time each grit is in the cut per revolution. However, the over-all effect is to increase slightly the per cent of the time an abrasive particle is doing work or cutting. Thus, we may say that the increased wheel speed reduces slightly the time an abrasive grit can cool in the over-all.

The resulting change should not be radical or dangerous as far as heating is concerned, and heat studies will be made under field conditions to evaluate this further. It is entirely possible that the net result would be a cooler running wheel, which would be beneficial for safety and most probably wheel efficiency as well.

We can see, therefore, a definite reason to consider increased wheel speeds, particularly on those operations where rapid metal removal and increased wheel efficiencies are required. The automatic swing grinder represents an area where these considerations are most applicable. First, because the economics are extremely favorable in this area; and second, because any dangers connected with increased speeds can be minimized by adequate protection devices.

Increased wheel speeds had to be accompanied by a careful consideration of all safety factors affected by this change. These could, in general, be divided into 3 areas:—

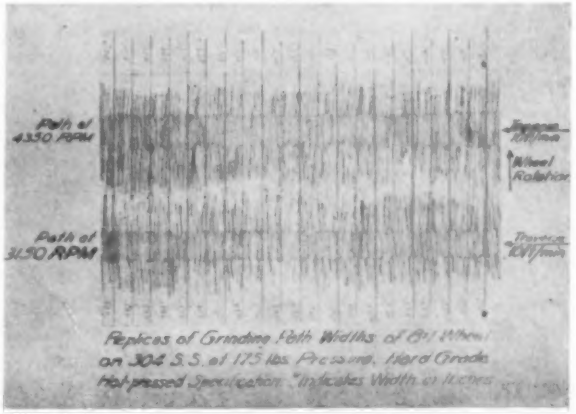
(a) the wheel
(b) the machine itself
(c) the operating conditions

Let's consider the wheel itself. How could a decision be reached to determine its ability to stand higher speeds? Measurements of actual strength in tension had shown hot pressed wheels to be roughly 112% stronger than standard general purpose cold pressed wheels. On the other hand, the densities of these hot pressed wheels are changed, in that they were 22% denser than general purpose cold pressed wheels. Using formula developed for design of fly wheels, we can calculate the effect of strength and density on the safe operating speeds.

Bursting speed of fly wheel is calculated, based on the following:—

$$V = K\sqrt{S/d}$$

V=Speed S.F.P.M.
K=Constant
S=Ultimate Tensile Strength of Material
d=Density



Replicas of Grinding Path Widths of 8" Wheel on 304 S.S. at 175 lbs. Pressure. Hard Grade Hot-pressed Specification. "In" Indicates Width in Inches

Figure 1

If we assume that the factor of safety for a higher operating speed must be equivalent to that in use in lower speeds, we can use this formula for a comparison.

$$\frac{V1}{V2} = \frac{S1d2}{S2d1}$$

S1=Ultimate Tensile Cold Press Wheel

S2=Ultimate Tensile Stress Hot Press Wheel

V1=Original Speed S.F.P.M.

V2=New Speed S.F.P.M.

d 2=New Density lbs./cu. in.

d 1=Old Density lbs./cu. in.

On the basis of equal safety factors noted above and increased strength and density changes, we can calculate, therefore, that a wheel which could be safely operated at 9,500 s.f.p.m. is now satisfactory at 12,730 s.f.p.m. with the new hot pressed bonds.

The increased speed (12,300 s.f.p.m.) alone is, therefore, more than adequately cared for by increased strength in hot pressed snagging wheels.

Recent work by the Grinding Wheel Institute at the Cornell Aeronautical Laboratory also showed that the wheel breakage was greatly affected by another factor. Heat affects both wheel strength and stresses generated by the heat during actual grinding. For this purpose, studies were made to determine the heat or temperature distribution during automatic swing grinding tests in our own laboratory. Based on this work, it was decided that the wheel bond design was able to withstand the combined heat and rotational stresses generated at higher speeds under laboratory conditions. Additional work, however, is still needed to determine accurately the changes in temperature distribution over the wheel brought about by changes in wheel speed under field conditions. It can be reasoned that this change in wheel speed could either raise the heat stresses slightly or lower them, based on the increased wheel speed and its cooling effects during grinding. This still must be further evaluated under field operating conditions.

Next, let us consider the machine itself and how it affects higher wheel speeds. We must assume that no matter what the safety factors are which may be designed into wheels, they may still be broken. Since increased wheel speeds must of necessity mean higher speeds imparted to wheel fragments, in the event of breakage, adequate guarding must be considered.

In this area, our recent tests were made using an improved guard developed by Fox Grinders, Inc., which covers at least 65% of the wheel on this Mid-West Grinder. Design of the guard provides for a welded steel cover of 1" thick top and ½" thick sides. A 1¼" thick by 4" to 12" wide steel brace is welded to the cover and to a steel strap 4" x 1¼" thick running over the cover to the mounting on the opposite side of the yoke. In addition to the guard, Fox Grinders has also designed the spindle to operate at the speed of 12,500 s.f.p.m. and under pressures of 1000 pounds.

An important part of any decision to increase the wheel speed is the environment or surrounding work conditions. Any attempt to increase the wheel speed should take into account the possible conditions which would exist should an accidental breakage take place. Here again, as shown by photo, the automatic grinder, Mid-West Abrasive Co., offers excellent protection for the operator. Normally, he would be the only person near the wheel. In the event that a wheel should be broken, the combination of a heavy guard protecting 65% of the wheel, and operating conditions as illustrated above, leave little chance of injury.

Taking all into consideration, therefore, we have excellent reasons for attempting a higher wheel speed test (12,300 s.f.p.m.) for hot pressed snagging wheels.

Arrangements were, therefore, made with Sharon Steel Corporation to study this effect using identical testing methods and specifications, but varying wheel speeds from 9,500 to 12,300 s.f.p.m. All wheels tested at higher speeds were also speed tested at speeds 50% higher than the actual operating conditions.

How did our results agree with the reasoning that higher speeds would help? The results are obvious in the table below. This test was run on 300 Type stainless at a head pressure of 635 lbs.

EFFECT OF WHEEL SPEED CHANGE

No. of Wheels Tested Each Speed	*8*
Wheel Life	Increased 48%
Total Metal Removed/Wheel	Increased 61%
Cutting Rate	Increased 15%
Cost/Net Ton Ground	Decreased 21%
Cost/Lb. Removed	Decreased 27%
% Removed*	Increased 8%
Wheel Efficiency	Increased 61%

***Effect noted may not be due to increased wheel speed. It seems reasonable to suppose that the per cent removed from a billet may vary slightly from billet to billet.**

In any case, these results certainly seem to indicate a pronounced improvement is possible with increased wheel speed. Couple this with the fact that to get similar increases in life and efficiency, it would take major changes in grinding wheel compositions. In this writer's opinion, no single wheel improvement we have made has nearly equaled the changes noted here.

Since wheel breakage was not increased by the use of higher speeds, this warranted still more testing under these conditions. Present plans call for a much larger sample of wheels to pin down more completely the effects noted. In addition, more detailed information will be determined on the wheel temperature distribution at both operating conditions. • • •

Special Report:
Shaped Diamonds for PORTABLE Form Truing

Shaped diamonds increase effectiveness of portable wheel forming instrument.

By F. O. HOAGLAND
Pratt & Whitney Co.

● Cutting action of the shaped diamond leaves a clean, open and free cutting surface on the formed wheels. The wheel dimensions can be more precisely developed and will last for a greater number of passes. These are the reasons for using precision shaped diamonds for wheel forming with the Pratt & Whitney Diaform portable wheel-forming instrument.

Three diamond tools are used by the Diaform in forming the face of an abrasive wheel, rough, semi-finish and finish. The rough tool is of natural shape and unground, with approximately .020" radius and 60° included angle. The semi-finish and finish diamond tools are both ground and polished to either .005" or .010" radius as required.

The roughing diamond tool is used only for the first "rough" forming of the wheel. A .010" radius diamond is then used and followed by either another .010" radius diamond or a .005" diamond depending upon the sharpness of the corners. Corners of .015" radii or less require the .005" radius diamond for final forming.

When properly used, the diamonds will hold their precise shape for considerable time. For work with the most rigid surface specifications, the diamonds must be occasionally re-polished by a diamond-cutter.

The blocks that hold the diamond tools when they are in contact with the abrasive wheel are bored at an angle of 5 degrees. This provides relief behind the actual cutting edge of the chisel-shaped diamond. The angle of the diamond shank must lean with the wheel rotation, not against wheel rotation.

In the majority of cases, it is possible to do the bulk of the wheel truing with the flanks of the outer edges of the truing diamond, and by so doing maintain the true curvature. If, after considerable use, the cutting edge of the finish truing diamond shows signs of wear, it can be reversed by turning it 180 degrees in its block. When the radii of both cutting edges of the finish diamond are worn to an untrue shape, the diamond can be used for semi-finish forming.

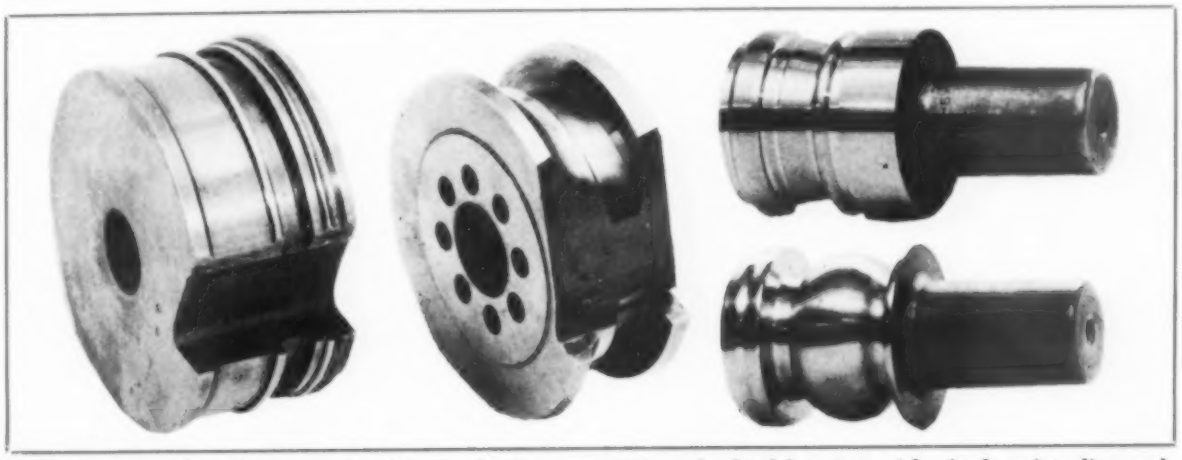
The most important precaution with regard to diamond life is to prevent overheating of the diamond tips. The harder the wheel, the greater the danger of overheating. A copious and steady supply of regular work coolant should be maintained during wheel forming. Wheel speed should be reduced by about 50 per cent on wheels of hard grade when truing. For forming the hardest grade wheels, smaller cuts—.002- to .003-inch per pass —should be taken from the wheel.

Forming the Wheel Is Fast and Simple

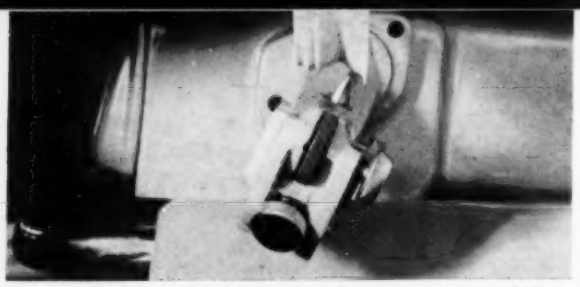
The time required to form a wheel depends on the diameter of the wheel, the width and depth of the form to be produced, the bond and grit in the wheel, the finish required on the machined pieces, and to some extent, the skill of the operator. An experienced operator usually takes from 15 to 30 minutes to form a new one-inch wide, ten-inch diameter wheel.

Almost any form can be produced on the grinding wheels, but the greatest latitude should be sought on internal corners, as the sharper the corner required, the longer the job will take.

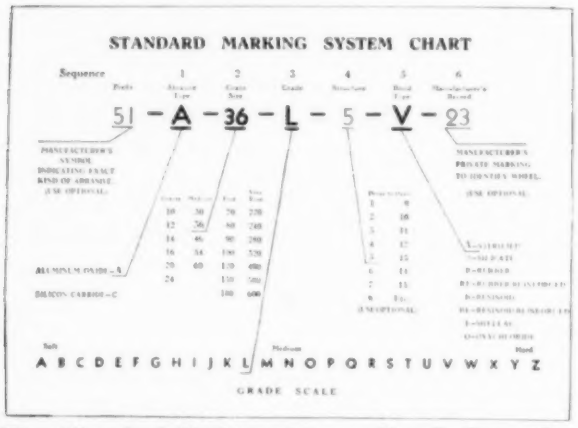
A profile drawing of the piece to be ground is transferred to a template. The template form



Above are examples of the complex forms which can be developed by form grinding. All the forms are the results of wheel-forming with single-point diamond tools.



New portable wheel-forming instruments and improved diamond tools, as illustrated here, have greatly enhanced the art of wheel forming.



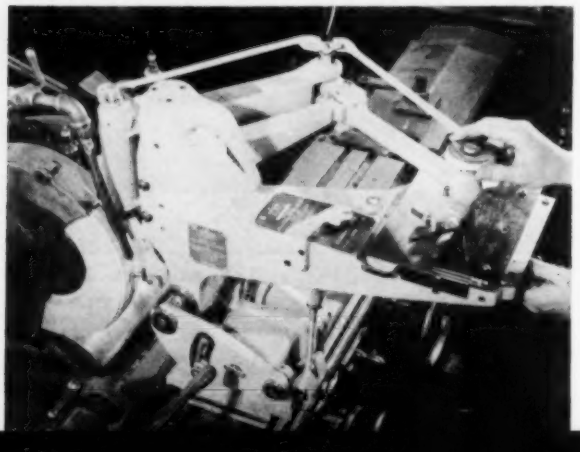
The "Standard Marking System Chart" shows the standard markings for wheels of aluminum oxide and silicon carbide, fine grit, and medium grade which are recommended for form grinding.

is made exactly five or, in some cases, exactly ten times larger and just the reverse of the form required on the finished piece. The template is secured to the mounting plate of the Diaform. The diamond tools are lined up by means of a gauge so that they will contact the blank wheel directly on a center line of the wheel spindle.

The desired form is then trued into the wheel face by successive passes of the tracer over the template edge. The operator's movement of the tracer guides the diamond tool as it cut-forms the wheel. Tangential guards prevent the grinding wheel from cutting the diamond mounting. These guards also prevent the diamond from overcutting the wheel.

The cross feed of the diamond forming tool during true-forming of a grinding wheel must be regulated according to the diameter of the wheel and the surface finish requirements.

In operation here is the Diaform wheel-forming portable attachment which transmits the dimensions of a wheel profile template to the wheel, through the pantograph linkage. Three diamonds are used to rough, semi-finish and finish the form in the wheel.



If the surface requirements of the machined piece are extremely rigid, then the diamond tool must be moved across the wheel at no more than ¼ or ½ the width of the diamond point for each revolution of the wheel. Faster crossfeed leaves imprints of the tool point on the face of the wheel. Where surface specifications for the finished piece are less rigid, the final forming of the wheel can be accelerated by increasing the cross feed of the diamond tool.

Wheel Sizes and Types Formed

An intermediate size model handles wheels up to 14 inches in diameter and produces forms up to two inches wide with a maximum form depth of one inch. It has a 5 to 1 pantograph ratio.

The largest wheel-forming model can be used for wheels up to 20 inches diameter. Maximum width of form is three inches and maximum depth is one inch. Its pantograph mechanism has 5 to 1 ratio.

The choice of correct grinding wheel is very important. Because of the ease with which wheel retruing is performed, the harder and coarser wheels should be avoided for better finish on the work and longer life for the truing diamonds.

For form grinding of high-speed steels or hardened tool steels, aluminum-oxide wheels have been found best suited. A grit size of 100 is the most satisfactory for all forms encountered, but a finer grade may sometimes be found preferable for small, clearly-defined forms. Vitrified bonds are generally preferred over silicate bonds. In the form-grinding of steels, a wheel of aluminum-oxide, 100 grit, grade G or H will prove satisfactory for most jobs. Forms with internal corners of a minimum of .008-inch radius can be readily ground using a finer and harder wheel such as one with 150 grit, grade I.

When any wheel is formed, it should be carefully balanced and mounted on the grinder and trued on all faces in the normal way before attempting to use the forming instrument. • • •

Truing is performed on a grinding wheel to grind the wheel shape or form to its proper dimensions. A grinding wheel is trued in order to restore its cutting face to running truth, so that its dimensions correspond exactly to specifications for the shape and surface of the piece being ground. The accuracy of the work depends on the wheel's trueness.

Dressing is performed on a grinding wheel to remove its outer layer of abrasive, either because the abrasive grains have become dull, or because the wheel has loaded up with material from the piece being ground. This presents a fresh face of the grinding wheel to the grinding job.

NORTON CO.

Automation Boosts Small-Billet Snagging Production

Automation of small-billet grinding cuts over-all costs by 20%-40% and doubles production per wheel.

By HARLOW G. JONES
Director Product Engineering
Mid-West Abrasive Company

● Successful application of the principles of mechanical snagging to the grinding of small stainless and tool steel billets is reported to have reduced the cost of the operation from 20% to 40%. In addition, production per wheel has at least been doubled, and billets that would formerly have had to be scraped have been salvaged.

These are some of the more spectacular results of the installation of a newly-developed Mid-West automatic billet grinder at the Bridgeville, Pennsylvania, plant of Universal-Cyclops Steel Corporation over a year ago.

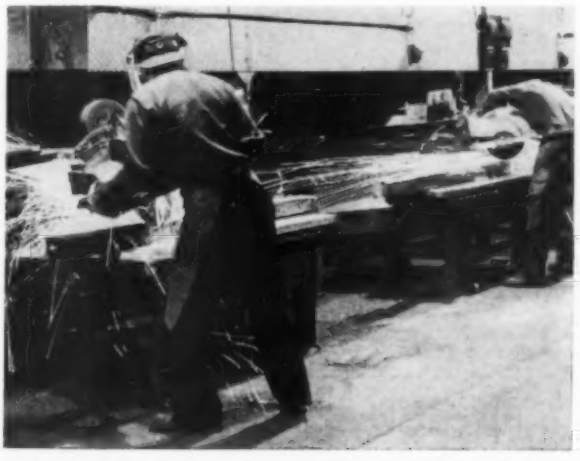
E. R. Daniels, superintendent of conditioning, has pointed out that 20″x3″x8″ resinoid wheels on the new machines are averaging about 1,000 pounds of metal removed per wheel, compared with an average of about 450 pounds for manual swing frame grinding and 800-1,000 pounds for a 24″x3″x 12″ wheel on a mechanical slab grinder.

Tool steel and stainless billets of the kind for which this machine is designed range in cross-section from 2″x2″ up to 8″x8″, and up to 96″ in length, with dimensions of 4″x4″x50″ and 6″x6″x42″ quite usual.

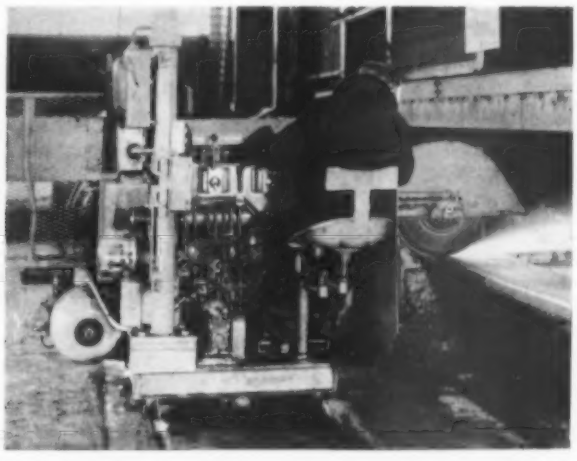
The big increase in metal removal per wheel, together with the much higher rate of metal removal per hour will result in a minimum of from 20-40% over-all savings.

The principles of the wheelhead mechanism have been known for ten years or more, and adequate

From muscles . . . to machines for snagging



The old way, dirty, disagreeable, tiring. Operators could exert about 100 to 250 pounds wheelhead pressure, often hung improvised weights on the handles to increase pressure and production.



Slab grinder, the predecessor of the automatic billet grinder. Hand levers control forward, backward, and vertical motion of the grinding wheel boom, and foot controls move the machine on the track.

Full view of the automatic billet grinder in action. From the loading rack (lower left) the billets are fed onto the conveyor. This device traverses the billet under the wheel, rotates it 90° at a time until all four sides are ground, then returns it to the discharge rack.

grinding wheels have been available.* The problem in grinding small billets has been to develop an adequate automatic handling mechanism.

Previous successful applications had involved a traveling wheelhead and a stationary workpiece—blooms or slabs up to 5″x40″x18′ or 3″x12″x 20′, and billets on the order of 6″x6″x10′.

The earlier models of these automatic grinders, which were often called billet grinders and which Mid-West now terms slab grinders, used 20″ wheels removing between 350 and 400 pounds of scale and surface defects per wheel, at a cost of 12¢ to 16¢ per pound of metal removed.

Introduction of a heavier, higher-powered model using 24 wheels raised the output per wheel up to 800 to 1,000 pounds, lowered the per-pound cost to a range of 10¢ to 14¢.

Advantages of these mechanical slab grinders, which hold true or are bettered by the new billet grinders, are the following:

1. Increased production—three or four times the rate of manual snagging.
2. Cleaner, more attractive working conditions, affording greater operator safety.
3. Better surface on work ground, thus reducing later defects.
4. A smaller, but more highly skilled work force.

For a smaller work force less supervision is required. Further, since the job is less disagreeable and tiring, labor turnover is likely to be lower, and the work span of individual operators is lengthened. Factors like dexterity and judgment become more significant, and brute strength much less important.

Briefly, the machine incorporates three units: one of which is a grinding wheel on a fixed wheelhead which may be moved forward or back, and oscillated so that the wheel can grind on the edges as well as the normal grinding face. (The wheelhead is in a fixed position vertical to the work.)

The second unit is a carriage mechanism which receives billets from the loading rack, conveys them under the grinding wheel, traverses them back and forth as the wheelhead indexes out and the grinding proceeds. The billets are rotated so that all four sides are ground and are then kicked off to a discharge rack when the snagging is complete. The billets need not be manually handled at any time during the grinding, unless the steel has deeper than normal surface defects or edge cracks. If this is the case, the operator switches off automatic and can spot grind these deeper defects. Sometimes in rush periods, it might even be desirable for some of the billets to be sorted from the unloading rack for a spot grind by either portable or small swing grinders.

The third unit is the loading rack with a capacity of ten billets 8″x8″ square and up to 8′ long, or

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*See the following articles from GRINDING and FINISHING; "Automatic Billet Grinding," November, 1957; "Why Super-Dense Resinoid Wheels Cut Snagging Costs," August, 1958; and "Effects of Materials on Snagging Wheel Performance," February, 1959.

correspondingly larger numbers of smaller billets. The billets are dropped on the loading rack by an overhead crane, and are pushed off the rack, one at a time, by a chain-and-dog drive.

In normal operation the depth of cut remains the same, and approximately 4% of the billet is removed. This is sufficient to take care of the scale and the usual run of the surface defects.

Deeper defects can be removed by spot grinding, operating the machine manually. Because of rapid application of heavy pressure, the wheel will cut fast with less burning than with the lower pressure of a swing frame grinder. While this slows down over-all production, it has been found that the machine operating at about 400 lbs. head pressure will remove deeper defects than can be removed by swing frame grinders with 100- 250 lbs. head pressure, and thus salvage many billets that would otherwise have to be scrapped. Such billets, however, generally must be re-rolled, and subsequently need a second light surface pass under the grinder. Aside from the salvage itself, such a course often makes possible the shipment of orders on schedule.

According to extensive test reports with this machine, as much as 80% of the operator's time is contact time, a considerable improvement over the possible number of contact hours for manual snagging. Also, since the operation requires little physical effort, fatigue never becomes a problem.

The machine is controlled by an operator who sits in the cockpit of the grinder with a clear view of the grinding action at all times. He is protected by a steel and safety glass partition. Operating in various fashions from completely automatic to manual control, the machine can be manipulated by the operator to meet almost any condition.

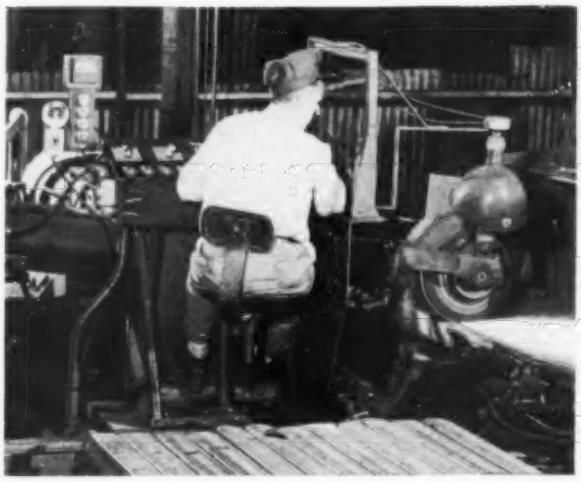
The length of travel of the carriage is controlled by electric limit switches with an adjustment for speed of travel on the operator's control panel. The carriage operates with hydraulic power actuated by means of limit switches to actuate the rotation of billet and to allow for automatic or controlled traverse motion. The machine has an adjustable cross-wise motion, automatically indexing in steps of from 0" to 2" for a distance of 14". Traverse speeds are adjustable from 0' to 260' per minute.

All operating functions of the machine, including wheel speed, rate of traverse, angle or oscillation of the wheel, and pressure of the wheelhead on the work, are subject to operator adjustment. Wheel speed, by means of a four speed transmission, can be increased as required to maintain proper surface feet as the grinding wheel is worn down. It has been found that it takes about two weeks for an operator to become proficient in operating the machine.

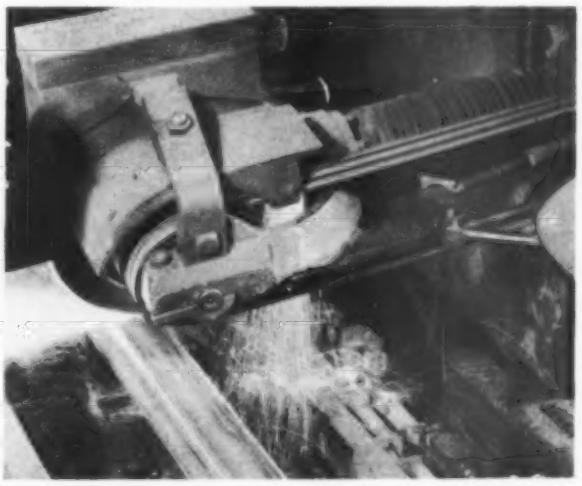
At Universal-Cyclops, it has been determined that a 20"x3"x8" resinoid bonded aluminum oxide wheel, 12 grit and of grade range U to W is most suitable. Optimum stock removal has resulted from a traverse rate of 40 feet per minute, with a wheelhead pressure of 400 pounds. The wheel is usually run in vertical position about one-half the time, and angled about 7° in the direction of wheel travel for the rest. • • •

(Photos courtesy Universal-Cyclops Steel Corp. and Mid-West Abrasive Company)

Front and back action closeups of the grinder . . .



An operator watches intently as a grinding wheel finishes one side of a billet. Note a portion of the control panel at his left.

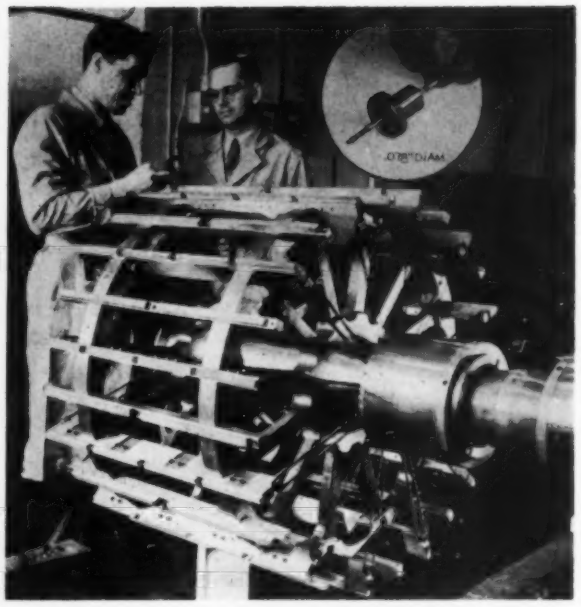


Back view showing the belt-driven wheel grinding in the angled position. The wheel runs at a 7° angle about half the time.

WHY HONING?

Part III

This third part of the honing series covers tools, abrasives and coolants. Previous parts have described applications, fundamentals, machines and fixtures. Future parts will discuss pitfalls, errors, corrections, how to apply and special application. It is also planned that the final part will provide a buyers guide of honing machines and tools.



Shown here is one of the largest tools 41″ in diameter by 63′ long. The insert shows one of smaller .078″ in diameter. Courtesy Micromatic Hone Corp.

By M. M. PATTERSON
Managing Editor

● The purpose of the honing tool is to direct the abrasive against the work surface with equalized pressure, thus providing the centering action. This centering action enables honing to obtain the high degree of geometric accuracy and direction. The controlled pressure also provides for even breakdown of the abrasive and thus highly controlled cutting action, finish and stock removal to size.

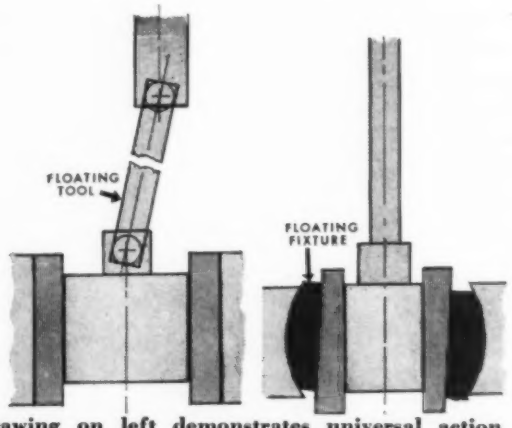
The honing tool consists of a drive shaft, push rod, body, cone or wedge, pins or plates (larger diameters) and stoneholders.

The drive shaft is attached to the head of the machine and drives the tool. The push rod provides the link for movement of the cones or wedge. As the cone or wedge is moved away from the head of the machine by the push rod, it forces the pins, plates and/or stoneholders laterally from the center of the tool.

An adjusting head is used when stone pressure is not provided for in the mechanism of the machine. The adjusting head is actuated manually causing the movement of the push rod. The angle of cone or wedge is matched by an angle on the pin, plate and/or stoneholder. This changes the movement or pressure of the push rod 90° to the stones with positive movement. In some designs, two cones are opposed and threaded oppositely, thus moving together when the push rod is rotated. This is to provide greater rigidity.

Width and number of stones depend upon the size of the bore. The length of the stone depends upon the length of the bore. For some extremely long bores, sets of stones are arranged in tandem. This arrangement will also be utilized for tandem bores. For blind-end bores, the lead end of the stones are located at the lead end of the tool.

There have been various theories as to whether the number of edges or amount of abrasive area presented to the work provide the best action. Still other designs provide a single stone opposed by two non-ferrous wear shoes which are irregularly-spaced to provide a balanced pressure.



Drawing on left demonstrates universal action of driveshaft. Right shows rigid drive shaft with the part floating in fixture. Courtesy Micromatic Hone Corp.

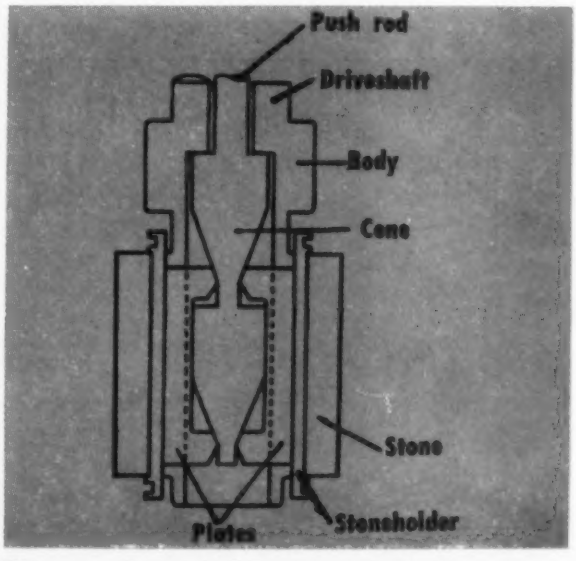


Diagram of a typical honing tool showing nomenclature.

Still another tool is designed with the stones and guides running in a spiral or oblique pattern on the periphery of the body. This design was developed to provide continual contact of the abrasive over the full circumference of the bore being honed. The stones bridge interruptions in the bore and are said to eliminate much of the chatter, stone breakage or hole distortion. Greater abrasive area is provided by increasing the length of stone for a given length of body.

Drive shafts are designed either rigged or with universals. In the case of rigid shafts, the parts are usually small enough so that they may float. In both cases it is the object to allow the honing tool to center itself in the bore and not alter the hole location. Still other design provides rigid shafts in all cases while holding the fixture or part location closer.

STONES

The action of the honing stone is quite different from that of other bonded abrasive applications. During the rotation and reciprocation of the honing operation, the individual abrasive grits on the surface of the stone are presented to the work at a continually varying direction. Another point of difference is the steady, balanced pressures of honing which are not matched by any other bond abrasive operation. This is considered one of the reasons why a large area of abrasive contacts are possible for honing and not practical for other operations.

Stone marking is, in most cases, the same as that of wheels; however, several companies have their own markings which often denote a finer division of bond grades.

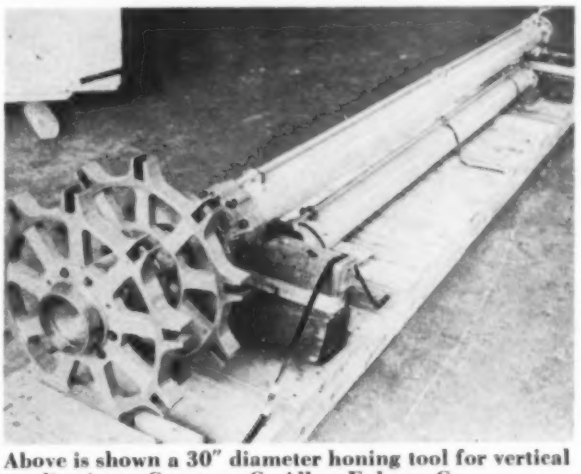
Generally speaking, the abrasive action is the same as that of other bonded abrasives. Silicon carbide is recommended for cast iron and nonferrous materials. Aluminum oxide is recommended for steel. Grit size ranges in finer sizes than for wheels. This is again due to the large amount of abrasive area of contact with the work which presents more points for cutting.

Bonds are also for the most part the same as those for wheels. The change in amount of bond hardness has the same effect. Structure and type of bonds are also the same.

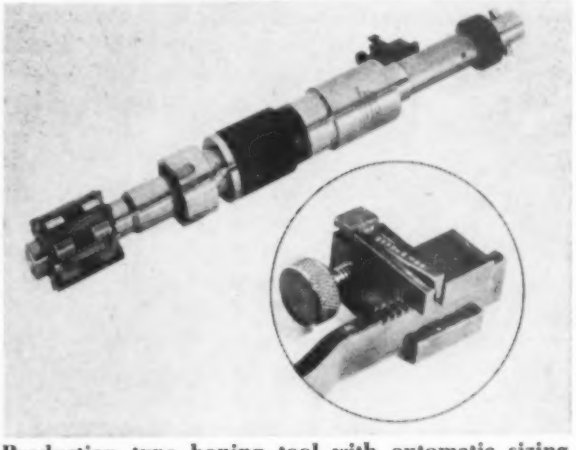
It should be noted here that there have been some new bonds and additional care taken in the preparation of stones by some manufacturers. This has been in the bond for the most part and has been along two lines. One has been the finer dividing of the standard grading or hardness. The other has been the density of the bond. A recent development is carbon-bonded, sintered abrasive which again was developed to provide greater control of grading or hardness. This bond is nonporous and is said to result in less loading, more efficient cutting action and cooler cutting.

In addition to the standard bonded preparations, fillers are sometimes used in honing stones. These

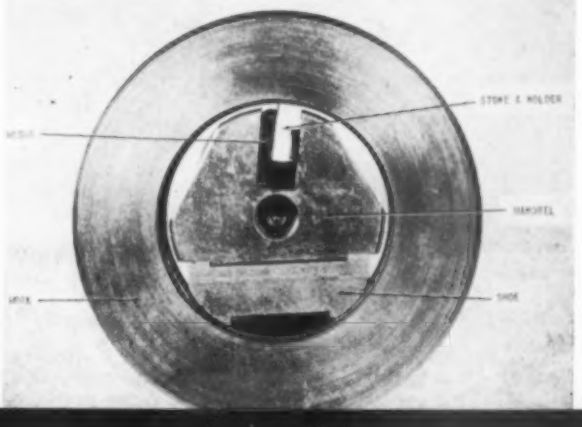
Honing tool shown here is typical of small diameter manual reciprocating type. Lengths are often greater than shown. Courtesy Sunnen Products Co.



Above is shown a 30" diameter honing tool for vertical applications. Courtesy C. Allen Fulmer Co.

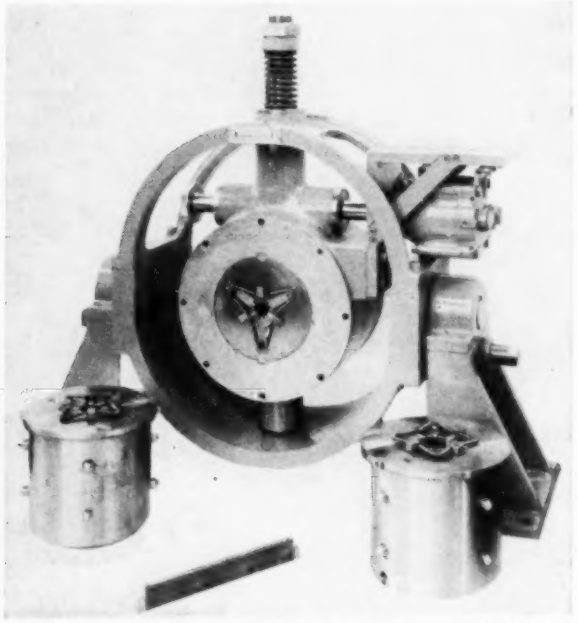


Production type honing tool with automatic sizing unit attached. Bore is sized on every stock of the tool. Courtesy Jes-Cal Co.



End view of a manually stroked honing tool with the parts noted. Courtesy Sunnen Products Co.

Multiple stones in tandem can greatly increase the length of abrasive in the tool. Courtesy Sunnen Products Co.



External type honing tool for diameters of 1⅜", 1" and ⅝". Courtesy Barnes Drill Co.

Production type honing tool for 2" diameter bores. Courtesy Barnes Drill Co.

include sulphur paraffins, resins, etc. The fillers are generally used to retard loading of vitrified bonded stones by soft materials. Fillers such as sulphur act as a lubricant providing a finer finish with given grade. It has also been used as an in between grade, such as in the case when M is too soft and N is too hard.

Resin fillers have been used to cut down excessive chatter on roughing operations starting with a very uneven surface.

The six most important factors to consider when selecting stones are: hardness of material, type of material, amount of stock to be removed, finish required, tolerance required and time allowed for the job.

With honing stones as well as other bonded products, it is important to remember that the grading of one manufacturer will not necessarily equal that of another. When an M grade stone is recommended, it should be treated only as a recommendation and it might well be found that an L of one manufacturer will be best or a N of another would be correct.

Shapes of the stones are commonly rectangular with a radius being formed or trued on the top of the stone. There are, of course, many shapes which are used in special applications and a T-shaped stone which is used most often for small bores.

Various codes are used to identify the shapes; however, the industry always indicates the size of the stone by height first, width second and length last. A stone described as ½" x ⅜" x 4" is ½" high by ⅜" wide x 4" long.

Stone mountings vary a great deal. The reason for mounting the stone is to provide a means of holding the stone and to provide protection to the stone and to the hone body.

The most common type in the past has been the shell. The shell was a stamping which is shaped like a channel in which the stone is cemented, either by glue or shellac. The shell usually is designed with thrust lugs to prevent movement of stone from reciprocation. The shell often also includes extensions which allow for retention springs to hold the stone and shell against centrifugal force.

For smaller bores, the stoneholder is a single piece machined with a channel for cementing the stone and shoes for contacting the cone or wedge. The stoneholder may also be plastic with steel reinforcing. One company molds this plastic around the stone while others cement the stone in the molded plastic shape. Still others have cemented plastic sheets to the sides of the abrasive. Still other designers of the plastic holders leave the lead edge of the abrasive open stating that this design allows the coolant to reach the stone instead of being wiped away by the leading plastic.

Some of the plastic coverings do not act as stoneholders. This design for larger bores requires either an expansion plate or pins that ride on the cone

or wedge. For still larger bores, the stone is clamped in a stone holder which is moved out by pins.

COOLANT

All honing operations are performed with coolant, and coolant used is a major factor in the honing action. Coolants have a definite effect upon the success or failure of any honing operation. They affect a honing operation in the following ways: lubricating action; cooling action; flushing action.

Generally speaking, a coolant should have the following characteristics to accomplish each of the above three actions of a honing coolant.

The lubricating action of a honing coolant depends largely upon its viscosity. For honing steel, a more viscous coolant is used than for honing cast iron which contains free graphite and has a much lower tensile strength. Kerosene is generally the base of all honing oils and the viscosity is controlled by adding a sulphurized lard oil or heavy cutting oil. The ideal condition is reached when the lubricating effect gives the maximum rate of cut with the minimum power input to drive the honing tool.

The ability to carry away heat is a very desirable characteristic of a honing coolant. It is not very likely that a honing operation will ever burn the work, but any excessive heat in the work can cause other undesirable effects. A change in coolant viscosity will surely result from excessive heat and along with it a change in cutting characteristics of the abrasive. Probably one of the most bothersome effects of heat is the change in work dimension. This change in dimension makes accurate sizing very difficult, and could not be tolerated in high production work. Refrigeration is often employed to keep the coolant temperature down. A large supply of coolant will also help toward this end.

Plain tap water is the most effective coolant from the standpoint of heat absorption. Water does not have sufficient lubricating qualities, however, to make it a successful honing coolant. Water also rusts the machine and the work. For these reasons, kerosene with additives has been most widely used as the best alternative despite the fact that its ability to absorb heat is about ½ that of water.

The flushing action of the coolant in any honing operation is extremely important. When a honestone is operated in a plain bore the individual grain particles have no opportunity to get rid of the chips they remove from the work because the abrasive never leaves the work with the exception of those grits at the ends of the stone which overtravel at each end of an open bore. As a hone stone reverses its direction of reciprocation the removed particles of metal and loosened abrasive are worked out across the face of the stone to the trailing edge and into the path of the coolant. If the coolant does not flush this material away quickly there is danger of it being worked back under the stones. If this action does take place,

Shown here are some of the plastic covered honing stones. Courtesy Barnes Drill Co.

either or both of two undesirable results may be noted. The first of these is loading of the stone face with metallic particles, the second is short stone life caused by the abrasive and metallic particles dressing the stone.

If the coolant is recirculated, and generally it is, it must be cleaned before it comes to the work again. (Grinding and Finishing—July 1958.)

In most cases a gravity (low pressure) flow in sufficient volume is satisfactory from a flushing standpoint. There are jobs which require a forced flow of coolant to get the proper flushing action. A good example of this is the oil well equipment supply companies which hone tubes about 1½" diameter and 20' long. The best results in this application have been obtained when the end of the tube away from the honing head is capped over, allowing runout room for the hone, and the coolant is forced through the tube under pressure. Where machines doing this work are not provided with a forced coolant feed, much trouble is encountered with metallic particles becoming imbedded in the stone.

In some cases kerosene is not acceptable because of the fire hazard. Mineral seal oil has been a substitute in these cases. • • •

The next issue will conclude this series. The last part will include a buyers guide for equipment, pitfalls, errors and corrections. Reprints will be available after the printing of the last part.

SUGGESTED COOLANTS

Material	Coolant	
	% Cutting Oil	% Kerosene
Monel Metal	10	90
Cast iron	40	60
Aluminum	20	80
Bronze, brass	20	80
Soft steel	30	70
Steel 30-40 "C"	40	60
Hard Steel	20-30	80-70

Standard Time Data For Grinding Part V

This is the last part of the series on Standard Time Data. It covers infeed centerless grinding, and snagging. The series has covered application of standard time data to many of the most common methods of grinding and describes the development of standard time data information and charts.

By E. A. CYROL and R. L. BORCK
E. A. Cyrol & Co., Chicago, Ill.
Management Consultants

● For our studies of infeed centerless operations, we had available Cincinnati No. 2, 3, and 4 centerless grinders. The data given on these pages applies to their operation, and can be regarded as a guide in establishing similar data in other plants. Some of the machines were equipped with auxiliary loading devices, ejectors and roller rests. We have confined our presentation to those devices in most general use, and to infeed type operations.

Element Description—Cincinnati No. 2 Centerless

1. Pick Up Piece. Figure 21, Table No. 1
   This element includes the time allowed to pick up a piece from a work table or skid and move it to a proximity of the work rest blade.
2. Position Piece in Machine. Figure 21, Tables 2, 3 & 4
   This element includes the time allowed to position a piece on the work rest blade; or on the work rest blade and roller support; between the grinding wheel and regulating wheel.
3. Advance Regulating Wheel. .027 Min.
   This element includes the time allowed to move the hand infeed lever down until the work touches the grinding wheel.
4. Retract Regulating Wheel. .017 Min.
   This element includes the time allowed to lift the hand infeed lever up to a full clear position.
5. Remove Piece from Machine. Figure 21, Tables 2, 3 & 4
   This element includes time allowed for the operator to remove piece from machine.
   A. When roller support is used allow .010 Min.
   B. When work rest blade is used allow .036 Min.
   C. When ejector is used allow .017 Min.
   (This element is done internal to retract of regulating wheel).
6. Aside Piece. Figure 21, Table No. 1
   This element includes the time allowed to move a piece from the work rest blade area and place it on a work table or in a skid.
7. Stop Coolant. .023 Min.
8. Stop Regulating Wheel. .025 Min.
9. Up Splash Guard. .018 Min.
   This element includes the time allowed to lift the front splash guard up to facilitate unloading.
10. Down Splash Guard. .023 Min.
    This element includes the time allowed to move the front splash guard down before grinding.
11. Start Regulating Wheel. .025 Min.
12. Start Coolant. .030 Min.

Element Description—Cincinnati Nos. 3 and 4 Centerless

1. Pick Up Piece. Figure 21, Tables No. 1, 2, 3 & 4
2. Position Piece in Machine
3. Position Piece on Loader. .021 Min.
   This element includes the time allowed to position a piece on loader arms. (This element is used only on special No. 3 Centerless).
4. Down Loader .034 Min.
   This element includes the time allowed for the operator to actuate the loader air control valve and for the loader to move down to the work blade. (This element is used only on special No. 3 Centerless).
5. Advance Regulating Wheel. Per Turn
   No. 3 Centerless .034 Min.
   No. 4 Centerless .057 Min.
   This element includes the time allowed to turn the infeed hand wheel counterclockwise until the work touches the grinding wheel. When arbor is used or when piece is difficult to remove, allow multiple turns. To observers option for safety purpose.
6. Retract Regulating Wheel Per Turn
   No. 3 Centerless .020 Min.
   No. 4 Centerless .033 Min.
   This element includes the time allowed to turn the infeed hand wheel clockwise until the work is clear of the grinding wheel. When arbor is used or when piece is difficult to remove, allow multiple turns. To observers option for safety purpose.
7. Up Loader. .034 Min.
   This element includes the time allowed for the operator to actuate the loader air control valve and for the loader to slide up to the top loading position. (This element is used only on special No. 3 Centerless).
8. Remove Piece from Machine. Figure 21, Tables 2, 3 & 4
9. Remove Piece from Loader. .017 Min.
   This element includes the time allowed to remove a piece from the loader arms. (This element is used only on special No. 3 Centerless).
10. Aside Piece. Figure 21, Table No. 1
11. Stop Coolant. .023 Min.
12. Stop Regulating Wheel. 0.25 Min.
13. Up Splash Guard. No. 3 Centerless .018 Min.
    No. 4 Centerless .023 Min.
14. Down Splash Guard. .023 Min.
15. Start Regulating Wheel. .025 Min.

Set Up:	Part No. AB 1164 Oper. No. 110
Grinding Wheel · Width 6-in	Part Name SLEEVE
Regulating Wheel R.P.M.	Machine Type #2 CINCIN Dept. No. 781
Ejector Arbor No.	Operation Description GRIND TO BL-2
Weight 0.5#	O.D. Size 1.102 Length Tolerance .001

Table # 1

Table

Weight	Pick Up	Aside
0# - 1#	.033	.034
1.1# - 5#	.040	.034
5.1# - 10#	.045	.034

Skid

Weight	Pick Up	Aside
5.1# - 10#	.059	.041
10.1# - 20#	.073	.051
20.1# - 50#	.093	.068

Position & Remove # 3 & 4

Weight	Position	Remove
0 - 3#	.027	.027
3.1# - 4#	.030	.030
4 1# - 7#	.035	.035
1# -11#	.040	.040
11.1# -19#	.045	.045
19.1# -30#	.050	.050

Position & Remove # 2

Weight	Position	Remove
0 - 1#	.026	.036
1.1# - 2#	.040	.036
2.1# - 5#	.051	.036
5.1# -10#	.060	.036

Remarks:

Handling Elements	#2	#3	#4	Minutes
Pick Up Piece	Table #1			033
Position Piece in Machine	Table #1			026
Position Piece in Loader		.021		
Down Loader		.034		
Advance Regulating Wheel	.027	.034	.057	027
Retract Regulating Wheel	.017	.020	.033	017
Up Loader		.034		
Remove Piece from Machine	Table # 1			
Remove Piece from Loader		.017		
Aside Piece Table Skid	Table # 1			
Stop Coolant	.023	.023	.023	
Stop Regulating Wheel	.025	.025	.025	023
Up Splash Guard	.018	.018	.023	
Down Splash Guard	.023	.023	.023	
Start Regulating Wheel	.025	.025	.025	
Start Coolant	.030	.030	.030	030
Load & Unload Arbor				
Remove Piece When Using Roller	.010	-	-	
Load & Unload Pcs. to & from Skid	.046	.046	.046	046
Gauging Time 030 - DONE DURING LAP				
.014 x 11 = .154				
Time Per .001 x No. of .001's Removed				154
Lap Out Time				090
Wheel Dress Allowance				040

Computed By G. SMITH Date 12-2-55	Total Minutes Per Piece	556
Checked By	Personal & Unavoidable 11.1%	062
Approved By	Total Production Time	618
Previous Pieces Per Hr. 50	Plus 20% Adjustment	124
Previous Standard Hrs. 2.000	Standard Minutes Per Piece	742
Date Entered 12-2-55 By	Standard Hrs. Per 100 Pieces	1.239
	Pieces Per Hour	80.8

Figure 21.

16. Start Coolant. .030 Min.
17. Cloth Splash Guard On and Off. .066 Min.
    This element includes the time allowed to position a cloth over the guard opening and to remove a cloth from the guard opening. This element not allowed unless requested by foreman.

Gaging

The gaging time values listed are based on the time allowed to check one dimension with gage listed.

Sheffield Gage

1. Under .0005 tol. Solid piece — **Up to 2" Lgth.**
   Gage every pc. one position = .070 Min.
   Gage every 10th pc. (2) additional positions
   2 x .04 = .080 ÷ 10 = .008 = .008 Min.
   .078 Min. Total

2. Under .0005 tol. solid piece — **Over 2" Lgth.**
   Gage every pc. one position = .070 Min.
   Gage every 10th pc. (4) additional positions
   4 x .04 = .160 ÷ 10 = .016 = .016 Min.
   .086 Min. Total

3. Under .0005 tol. thin wall piece — **Up to 2" Lgth.**
   Gage every pc. one position = .070 Min.
   Gage every 5th pc. (2) additional positions = .016 Min.
   2 x .04 = .080 ÷ 5 = .016
   .086 Min. Total

4. Under .0005 tol. thin wall piece — **Over 2" Lgth.**
   Gage every piece one position = .070 Min.
   Gage every 5th pc. (6) additional positions
   6 x .04 = .240 ÷ 5 = .048 = .048 Min. Total
   .118 Min. Total

5. .0005 to .001 tol. — **Up to 2" Lgth.**
   Gage every 5th pc. one position = .014 Min.
   .07 ÷ 5 = .014
   Gage every 15th pc. (2) additional positions = .0053 Min.
   2 x .04 = .08 ÷ 15 = .0053
   .0193 Min. Total

6. .0005 to .001 tol. — **Over 2" Lgth**
   Gage every 5th piece one position = .014 Min. Total
   .07 ÷ 5 = .014
   Gage every 10th pc. (4) additional positions = .016 Min.
   4 x .04 = .16 ÷ 10 = .016
   .030 Min. Total

7. .001 and over tol. — **.007 Min.**
   Gage every 10th pc. one position
   .07 ÷ 10 = .007

8. When using an arbor
   Use constant — .118 Min.

Diameter		Time Allowed Per .001	
Over	Thru	Type I	Type II
	.250	.005	.0025
.250	.500	.008	.005
.500	.750	.012	.007
.750	1.000	.021	.012
1.000	1.250	.025	.014
1.250	1.500	.029	.017
1.500	1.750	.035	.020
1.750	2.000	.041	.024
2.000	2.250	.047	.027
2.250	2.500	.051	.029
2.500	2.750	.059	.033
2.750	3.000	.063	.036
3.000	3.250	.067	.038
3.250	3.500	.071	.040
3.500	3.750	.075	.043
3.750	4.000	.084	.048

Figure 22. Time to remove .001" stock from O.D. on Cincinnati No. 2 centerless. Type I represents times for grinding to within .0005" in one pass or thin wall parts. Type II represents times for grinding rough with another operation to follow or when tolerance is greater than .0005".

Plus one piece check — .078 Min.
.196 Min. Total

Concentricity Gage
1. Under .0005 tol. — **.016 Min.**
   Gage every 5th piece
   .082 ÷ 5 = .016 Min.
2. .0005 to .001 tool. — **.008 Min.**
   Gage every 10th piece
   .082 ÷ 10 = .0082 Min.

Micrometer
1. Under .0005 tol. — **.210 Min.**
   Gage every piece
   Each additional position **.080 Min.**
2. .0005 to .001 tol.
   Gage every 5th piece
3. .001 and over tol.
   Gage every 10th piece

Personal & Unavoidable Delay

Allowance 11.1% as with other operations.

Explanation of Work Sheet— Centerless Infeed Grinding

A standard is calculated on the following pages through the use of the Standard Data Work Sheet. The example is intended to serve as a guide to the prescribed method of determining a production standard with the Standard Data described in the preceding pages of this write-up.

In the event a standard is challenged, the work sheet, along with all necessary pertinent and supporting data, is generally the basis of any investigation of the standard.

When additional elements not included on the work sheet are found to be necessary, a time study should be taken to obtain this information. This additional element should be recorded in the write up for future reference and development of data for this element.

1. Fill in upper right hand corner of work sheet with Part No., Oper. No., Part Name, Machine Type, Machine No., Dept. No., Operation Description, O.D. Size, Length and Tolerance.
2. Transcribe time values for handling and machine elements, listed under type of machine used, to right hand column, Refer to Figure 21, Table No. 1 for time values for "Pick Up," "Aside," "Position" and "Remove." If the rout-

Diameter		Time Allowed Per .001		Diameter		Time Allowed Per .001	
Over	Thru	Type I	Type II	Over	Thru	Type I	Type II
	.750	.0095	.0054	5.000	5.250	.0661	.0378
.750	1.000	.0126	.0072	5.250	5.500	.0690	.0395
1.000	1.250	.0158	.0091	5.500	5.750	.0724	.0414
1.250	1.500	.0188	.0108	5.750	6.000	.0754	.0431
1.500	1.750	.0229	.0131	6.000	6.250	.0786	.0449
1.750	2.000	.0251	.0144	6.250	6.500	.0817	.0467
2.000	2.250	.0292	.0167	6.500	6.750	.0850	.0486
2.250	2.500	.0315	.0180	6.750	7.000	.0880	.0503
2.500	2.750	.0347	.0198	7.000	7.250	.0912	.0521
2.750	3.000	.0377	.0215	7.250	7.500	.0942	.0539
3.000	3.250	.0410	.0234	7.500	7.750	.0975	.0557
3.250	3.500	.0440	.0251	7.750	8.000	.1006	.0575
3.500	3.750	.0473	.0270	8.000	8.250	.1038	.0593
3.750	4.000	.0502	.0287	8.250	8.500	.1068	.0610
4.000	4.250	.0535	.0306	8.500	8.750	.1131	.0646
4.250	4.500	.0565	.0323	8.750	9.250	.1157	.0661
4.500	4.750	.0598	.0342	9.250	9.500	.1182	.0675
4.750	5.000	.0628	.0354	9.500	9.750	.1206	.0689
				9.750	10.000	.1256	.0718

Figure 23. Time to remove .001" of stock with No. 3 & 4 Cincinnati centerless grinders. Type I represents times for grinding to less than .001" in one pass or to less than 32 microinch finish or thin walled parts. Type II represents times required for rough grinding with operation to follow or when the tolerance is greater than .001".

ing calls for a special fixture or arbor to be used, a clocked cycle will have to be taken and that time value noted on work sheet.
If an automatic loader is to be used, the values for "Position Piece in Machine" and "Remove Piece from Machine" are not used. If an automatic loader is not used, the values for "Position Piece in Loader," "Down Loader," "Up Loader" and "Remove Piece from Loader" are not used. The time values "Stop Coolant," "Stop Regulating Wheel," "Up Splash Guard," "Down Splash Guard," "Start Regulating Wheel" and "Start Coolant" are allowed for all jobs running on No. 4 Cinn. and for grinding over 3" diameters on No. 3 Cinn., and for all arbor jobs. These values are all allowed on the No. 2 Cinn. only on request of the foreman.

3. Allow "Load and Unload Pc. to and from Table" value if needed. This value is usually allowed only for pieces weighing 5 lbs or less.
4. Fill in and compute "Grinding Time" formula. "Personal and Unavoidable" line.
Refer to Figure 22 for No. 2 Centerless and Figure 23 for No. 3 and No. 4 Centerless for time values "Time to Remove .001 Stock." Add the TIR allowance held on previous operation to amount of stock being removed. Transcribe grinding time to right hand column.
5. Fill in "Lap Time" value. Refer to Figure 24 for No. 2 Centerless and Figure 25 for No. 3 and No. 4 Centerless. When lapping is lower than gauging time this element is then internal to gauging.
6. Fill in the "Wheel Dress Allowance." Refer to Figure 26 for No. 2 Centerless and Figure 27 for No. 3 and No. 4 Centerless.
7. Write in any other information needed, under "Remarks."
8. Add up right hand column and enter total on "Total Minutes Per Piece" line.
9. Add allowances and calculate standard.

Diameter		Lap Out Time In Minutes
Over	Thru	
	.250	.044
.250	.500	.058
.500	.750	.070
.750	1.000	.082
1.000	1.250	.090
1.250	1.500	.108
1.500	1.750	.120
1.750	2.000	.132
2.000	2.250	.144
2.250	2.500	.156
2.500	2.750	.168
2.750	3.000	.180
3.000	3.250	.192
3.250	3.500	.204
3.500	3.750	.216
3.750	4.000	.228
4.000	4.250	.241
4.250	4.500	.254
4.500	4.750	.266

Figure 24. Lap out time for No. 2 Cincinnati centerless grinder.

Iron Grinding (Snagging)

Not to side-step the advantages of the standard data approach, this part discusses the development of data for work of a less critical nature than the precision machine grinding. The rough grinding of iron castings to remove parting lines, gates, risers and core prints. Unlike the machine grinding the feed and pressure is all manual and the industrial engineer must be careful in determining the time formula when finalizing the data. The useful aid here is the graph, Figs. 28 & 29. By posting the time values from many observations onto graph paper, for the physical characteristics of the grinding element involved, this decision is made easier. Bypass the method of least squares and use your good judgment and "horse sense" when drawing in the graph's curve. (After all, your plotted points represent judgments of people who in turn were judging their own work in both time and quality.)

Handling and Grind Elements

1. Handle Casting Per Cst. Figure 30, Table 1
This element includes the time to pick up the casting from a pan, barrel, or floor location and to place it to the wheel in position to grind. After grinding, to toss or place side casting to container. The times for small castings have been grouped according to their physical shape.
Group A: Castings with little or no form or shape such as hubs or boxes.
Group B: Castings in forms of ells, tees, spiders, etc.
2. Grind Gate or Riser Per Occ.
This element includes the time to grind off excessive gates or risers and to turn or reposition the casting as necessary. The times have been grouped according to type and location of gate and weight.
Group A: Gate in full view or straight.
Group B: Contoured surface or gate located near bosses or projections.

	Group A
0-1 lb. Castings	.007 + (.833 x cu. in.) = T
over 1 lb.-10 lb. Castings	.008 + (1.010 x cu. in.) = T
	Group B
0-1 lb. Castings	.017 + (1.083 x cu. in.) = T
over 1 lb.-10 lb. Castings	.018 + (1.310 x cu. in.) = T
over 10 lb -25 lb. Castings	.019 + (1.466 x cu. in.) = T
over 10 lb.-25 lb. Castings	.009 + (1.140 x cu. in.) = T

3. Grind Parting Lines or Core Prints Per Occ.
This element includes the time to grind off excessive parting lines or core print and to turn or reposition the casting as necessary. The times have been grouped according to type and location of fins.
Group A: Light fin and in straight line.
Group B: Contoured surface or fin located near bosses or projections.
Group A: .006 + (.0089 x lineal in.) = T
Group B: .014 + (.0124 x lineal in.) = T
4. Change Wheel Per Occ. 2.50 Min.
This element includes the time to stop the wheel, loosen and remove nut, washer and wheel; to replace new wheel, washer and nut; to start grinder and to dress new wheel.
5. Change Belt Per Occ. 3.33 Min.
This element includes the time to stop the machine, remove worn belt, replace with new belt, start machine and to grease new belt.
6. Dress Wheel Per Occ. .18 Min.
This element includes the time to pick up wheel dresser; to dress wheel and to aside dresser.

Diameter		Lap Out Time In Minutes
Over	Thru	
	.250	.044
.250	.500	.058
.500	.750	.070
.750	1.000	.082
1.000	1.250	.090
1.250	1.500	.108
1.500	1.750	.120
1.750	2.000	.132
2.000	2.250	.144
2.250	2.500	.156
2.500	2.750	.168
2.750	3.000	.180
3.000	3.250	.192
3.250	3.500	.204
3.500	3.750	.216
3.750	4.000	.228
4.000	4.250	.241
4.250	4.750	.254
4.500	4.750	.266
4.750	5.000	.278
5.000	5.250	.290

Figure 25. Lap out time for No. 3 & 4 Cincinnati centerless grinders.

7. Grease Belt — Per Occ. — .05 Min.
   This element includes the time to pick up the grease stick; to grease belt and to aside stick.
8. Change Containers — Per Occ.
   a. Pans — .65 Min.
   b. Barrels — 1.35 Min.
   c. Skids or Pallets — 2.25 Min.
   This element includes the time to move a container of finished stock to an out-of-way floor area; to transfer the empty container to the aside area, and to move a full container into the pick-up area. Time has been included to obtain the hand truck for skids or pallets.

Explanation of Work Sheet

A sample time is calculated on the following pages through the use of the Standard Data Work Sheet, Figure 30. This example is intended to serve as a guide to determining a production standard with the application of the Standard Data described in the preceding pages of this write-up.

1. Indicate in space provided the type of wheel used.
2. Draw in simple sketch of surfaces ground or give detailed description.
3. From Table 1 select correct casting handling time and enter in the Total column.
4. Determine cubic inches of gate or riser to be ground and calculate time from the equation shown for the type of casting involved. Enter in the Total column.
5. Determine lineal inches of parting line or core print to be ground and calculate time from the equation shown for the type of casting involved. Enter in the Total column.

IRON GRINDING WORK SHEET

PART NO.: 100373 PART NAME: Case PATTERN NO.: 12273 OPER. NO.: 20

OPER. DESCRIP.: GRIND PARTING LINE, GATE & RISERS DATE: 7-23-59

WHEEL TYPE: #60E. 12" X 2" COMPUTED BY: HJ CHECKED BY: RCB FOREMAN APPROVED:

SKETCH

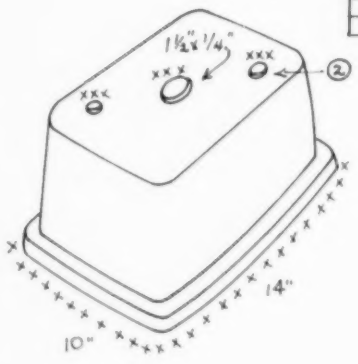


TABLE 1

CST. WEIGHT	A TYPE	B TYPE
0-1#	.026	.039
2	.028	.042
3	.030	.045
4	.032	.047
5	.034	.049
10	.056	
15	.067	
20	.079	
25	.091	
30	.102	

ELEMENT	TOTAL
1. HANDLE CASTING TABLE 1	.067
2. GRIND GATE OR RISER: "A" 0-1# Cst. .007 + (.833 X ____ CU. IN.); OVER 1-10# Cst. .008 + (1.010 X ____ CU. IN.); OVER 10-25# Cst. .009 + (1.140 X .636 CU. IN.) "B" 0-1# Cst. .017 + (1.083 X ____ CU. IN.); OVER 1-10# Cst. .018 + (1.310 X ____ CU. IN.); OVER 10-25# Cst. .019 + (1.466 X ____ CU. IN.)	.734
3. GRIND PARTING LINE OR PRINT: GROUP A .006 + (.0089 X 48 LINEAL IN.); GROUP B .014 + (.0124 X ____ LINEAL IN.)	.433
4. CHANGE WHEEL: 85 min. of Grd. + 1.167 Grd. Min = 73 PCS. 2.50 Min 1.73 PCS.	.034
5. CHANGE BELT: 100 min. of Grd ÷ Grd. Min. = ____ PCS. 3.33 Min / ____ PCS.	
6. DRESS WHEEL: 73 PCS. (Ele. 4.) X 2 % = 1.5 PCS. .18 Min. 1.5 PCS.	.120
7. GREASE BELT: ____ PCS. (Ele. 5.) X 1 % = ____ PCS. .05 Min. / ____ PCS.	
8. CHANGE CONTAINERS: PANS .65 Min. / ____ PCS.; BARRELS 1.35 Min. / ____ PCS.; SKIDS OR PALLETS 2.25 Min. / 45 PCS.	.050
TOTAL MINUTES PER PIECE	1.438
PERSONAL & UNAVOIDABLE 7%	.101
TOTAL PRODUCTION MINUTES	1.539
20% BONUS ADJUSTMENT	308
TOTAL ALLOWED MINUTES PER PIECE	1.847
STD. HOURS PER 100 PIECES	3.078
STD. PIECES PER HOUR	32

Figure 30. Standard Time Data work sheet for iron grinding or snagging of castings. This illustrates application of work sheet for this type operation.

Diameter		No. of Pieces Per Dress	Time Allowance Per Piece		
			Type I		Type II
Over	Thru		6" Width	1-1/2" Width	6" width
	.250	140	.032	.015	.018
.250	.500	100	.045	.021	.025
.500	.750	85	.053	.024	.029
.750	1.000	75	.060	.028	.033
1.000	1.250	62	.073	.033	.040
1.250	1.500	53	.085	.039	.047
1.500	1.750	48	.094	.043	.052
1.750	2.000	44	.102	.047	.056
2.000	2.250	41	.110	.050	.060
2.250	2.500	38	.118	.054	.065
2.500	2.750	36	.125	.058	.069
2.750	3.000	34	.132	.061	.073
3.000	3.250	32	.141	.065	.078
3.250	3.500	30	.150	.069	.083
3.500	3.750	27	.167	.077	.092
3.750	4.000	25	.180	.083	.099

Figure 26. Wheel dress allowance No. 2 Cincinnati centerless grinder. Times are based on total times of 4.50 min. for 6" wide wheels, Type I; 2.48 min. for 6" wide wheel Type II; 2.07 min. for 1½" wide Type I. If .005" or less stock is being removed use half the time allowed.

Diameter		No. of Pieces Per Dress	Time Allowance Per Piece		
			Type I		Type II
Over	Thru		6" Width	2 Dia. Wheels	6"Width
	.250	140	.032	.035	.018
.250	.500	100	.045	.050	.025
.500	.750	85	.053	.059	.029
.750	1.000	75	.060	.067	.033
1.000	1.250	62	.073	.081	.040
1.250	1.500	53	.085	.094	.047
1.500	1.750	48	.094	.104	.052
1.750	2.000	44	.102	.114	.056
2.000	2.250	41	.110	.122	.060
2.250	2.500	38	.118	.132	.065
2.500	2.750	36	.125	.140	.069
2.750	3.000	34	.132	.147	.073
3.000	3.250	32	.141	.156	.078
3.250	3.500	30	.150	.167	.083
3.500	3.750	27	.167	.185	.092
3.750	4.000	25	.180	.200	.099

Figure 27. Wheel dress allowance No. 3 & 4 Cincinnati centerless grinder. Times based on total times of 4.50 min. for 6", Type I, wheel; 10 min. for 2" wheel; 2.48 min. for Type II. When removing .005" or less, use half the time allowance.

6. Determine the factor for prorating the wheel or belt changing time by dividing the total grind time into "Mins. of Grind" shown for the wheel or belt and then divide this factor into the wheel or belt changing time. Enter in the Total column.
7. Multiply the factor determined in Step 6 by per cent shown and divide this figure into the time shown for wheel dressing or belt greasing and enter the time per piece in the Total column.
8. Determine number of pieces for the standard container and divide into the time shown for container changing and enter the time per piece in the Total column.
9. Total the time values entered in the Total column and enter on the "Total Minutes per Piece" line.

The standard pieces and hours are then calculated in the same manner as previously prescribed for the other data.

This part completes the series on Standard Time Data and we would like to congratulate E. A. Cyrol and R. L. Borck for their splendid job of developing this material. Reprints which will include all five parts will soon be available. In total they will include development of the data and charts, and application to tool room grinding, cylindrical, surface, centerless and snagging. The reprints will cost $1.00 each for quantities under 25. In quantities over 25 please write for prices.

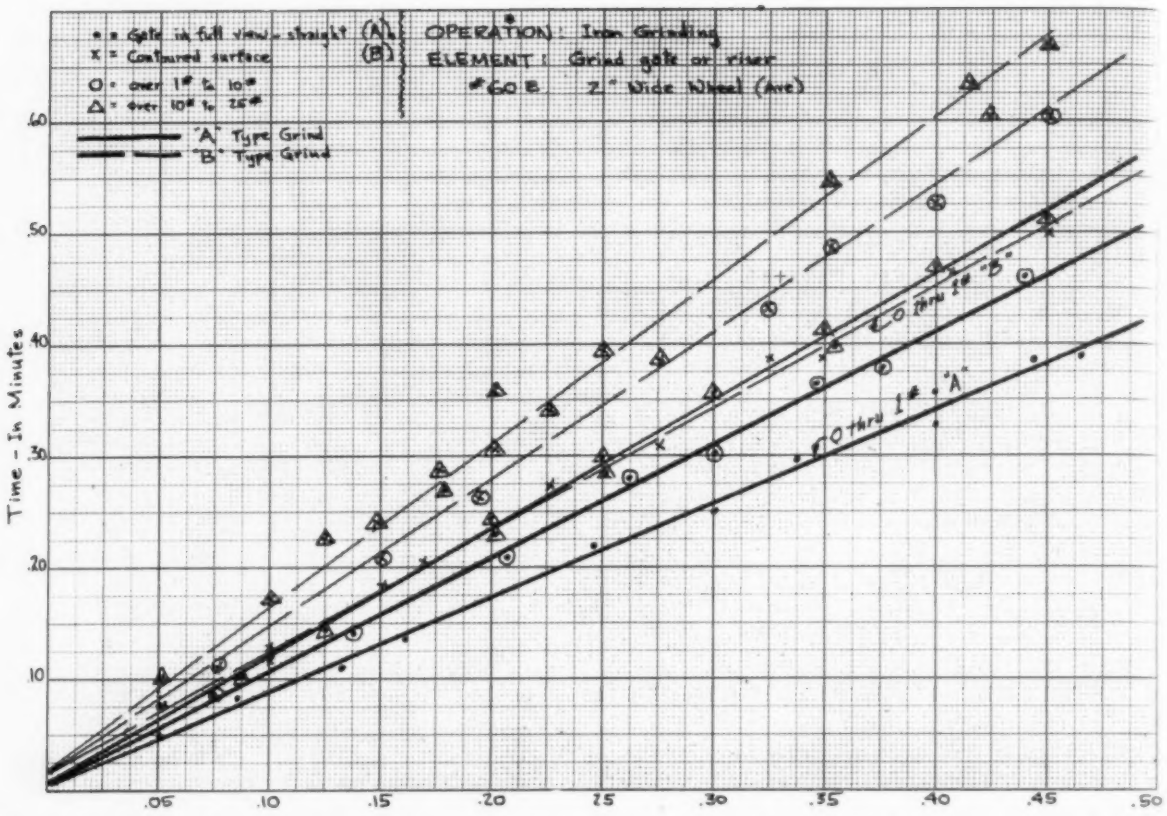


Figure 28. Graph above has resulted from plotting time and cubic inches for snagging gates or riser from casting. These graphs are very helpful for operations which involve so much manual operation.

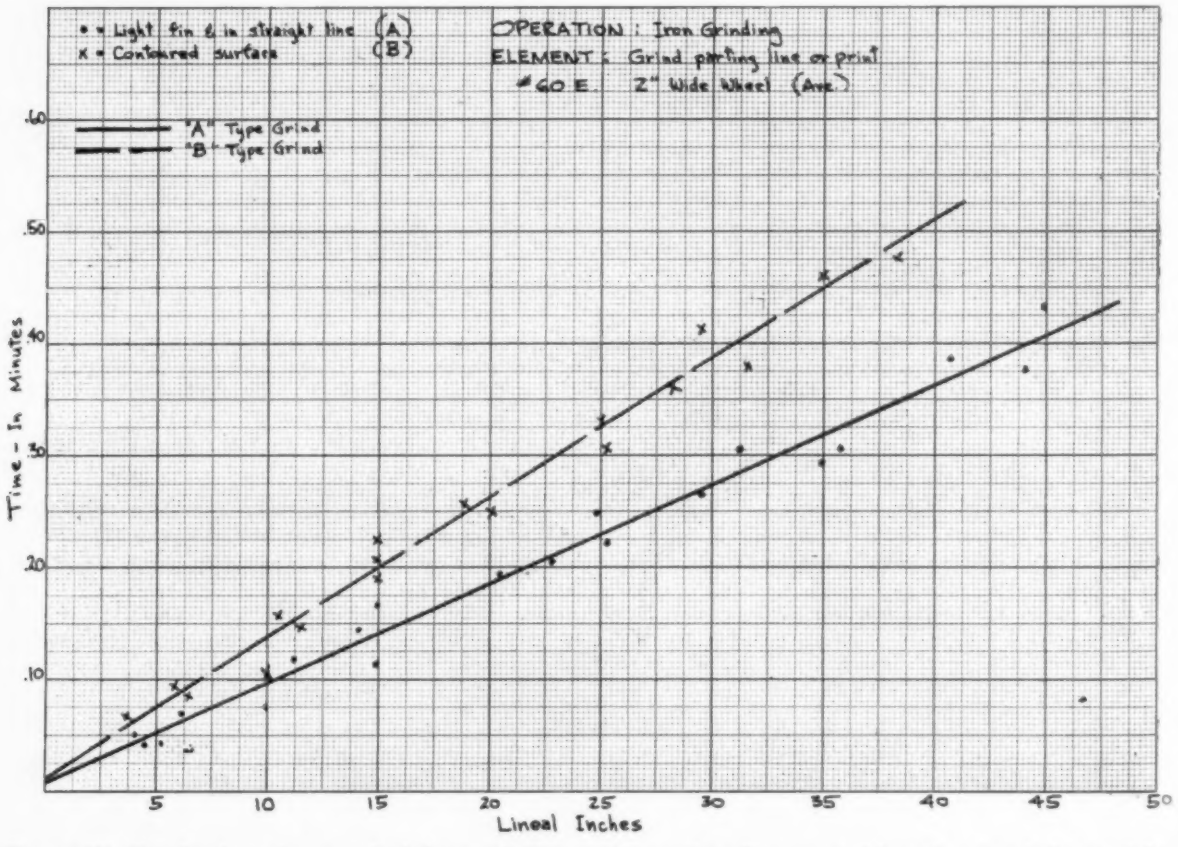


Figure 29. Graph above has resulted from plotting time and lineal inches for snagging the parting line of a casting. Represented here is a graph for straight line A and contoured surface B.

GRINDING WHEELS

"U.S." Grinding Wheels installed on Naxos-Union roll grinder.

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● For the first time in industrial history, disc grinding can now be performed with the work-point in full view of the operator as he grinds.

To get this result, Behr-Manning Co. of Troy, N. Y., a division of Norton Company, has developed a special fiber-backed abrasive disc with two parallel straight sides. The resultant product is a rectangular section with a radius at each end.

As such a "disc" rotates, a full inch at its outer edge—the area where all disc grinding is done—becomes transparent. Grinding is faster because the abrasive disc need not be moved away from the work point for frequent inspection. Dwell time is reduced because grinding can be confined to the exact area that requires it. Contour work and blending of welds can be done with complete

The "disc" in action. Note that the operator can see exactly what he is grinding.

accuracy. And, because the actual grinding is intermittent, the metal remains so cool that burning and heat distortion are practically impossible.

The new "Vizi-Discs" are available in 7-in. and 9-in. sizes. They are surfaced with the sharp-cutting Metalite, an aluminum oxide abrasive, in the standard range of grit sizes. In use, they are supported by sisal-reinforced rubber back-up pads slightly smaller than the abrasive disc. Heavy-duty pads of the same construction are available for aggressive grinding. Pads are surfaced with a diamond grid pattern to prevent slippage.

Accessory kits contain a pad, a retainer nut and a wrench. • • •

New Diamond Available For Metal Bonded Wheels

● The development and commercial availability of a man-made diamond for metal bonded grinding wheels has been announced by the Metallurgical Products Department of General Electric Company.

Coming just over two years after G.E.'s Metallurgical Products Department announcement that man-made diamonds for vitrified and resinoid bonded wheels were commercially available, the commercial availability of this new product is another step towards G.E.'s goal of developing a full line of man-made diamonds that will answer every industrial need.

The development of this man-made diamond that possesses ideal characteristics for application in metal bonded wheels is a result of intensive laboratory research, and is actually a different *type* of diamond crystal than the ones which have already proved superior to the natural product in vitrified and resinoid bonded wheels.

Typical particles of the new diamond are of single crystal and blocky shape, with many showing regular crystal faces. The color ranges from light green to gray-black with light colored particles predominating.

Crystal surfaces are smoother than the resinoid-vitrified bonded type, but are still considerably more irregular than the surface of natural diamond fragments of similar size.

They are available in sizes up to 100 mesh, and will be used in metal bonded grinding wheels for lens laps, glass grinding, (including pencil edging and beveling) electrolytic grinding and conventional grinding on cemented carbide. Other applications favored by the new man-made diamond development are forming and shaping of synthetic sapphires, cutting germanium and quartz, and the grinding of ceramics for missile components, such as ceramic nose cones.

The development of man-made diamonds by General Electric for metal bonded applications lessens still further industry dependence on sources of natural diamonds for grinding operations on extremely hard materials. • • •

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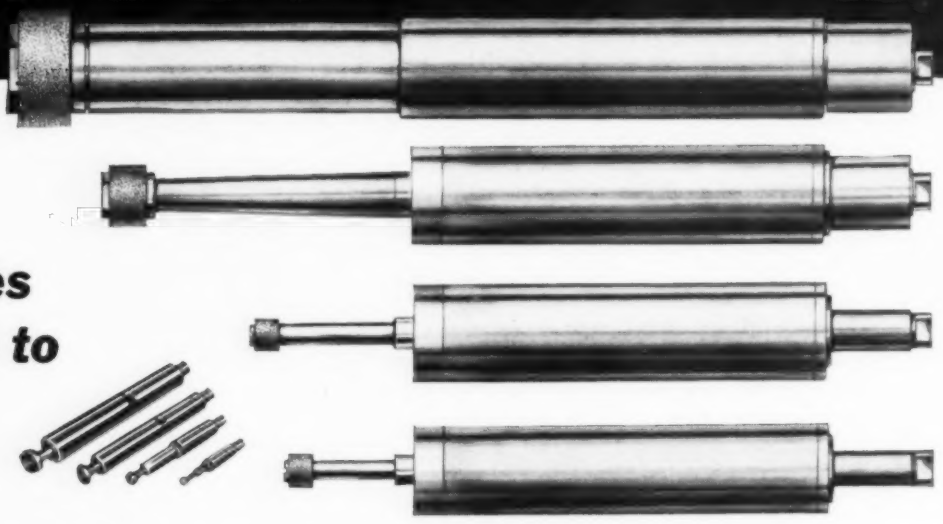
SPRINGFIELD
and others



with important new features that add up to

TOLERANCES TO MILLIONTHS

super-precision bearings made to Pope specifications and used exclusively in Pope spindles

total eccentricity of shaft, measured in the tapered hole, will not exceed 20 millionths (.000020)

Assembled spindles are dynamically balanced with all rotating parts in full assembly to 25 millionths (.000025) amplitude of vibration. This assures low micro-inch surface finishes.

INCREASED PRODUCTION

Pope Spindles have the rigidity and the ability to take heavy cuts and produce uniform parts.

LOWER OPERATING AND MAINTENANCE COST

Increased wheel life because the extra large shaft is rigidly supported by ample size bearings.

Saved operating time — one motor driving pulley serves all spindles in most cases.

Permanent lubrication — Pope system of grease lubrication prolongs bearing life, minimizes maintenance expense, and the spindles run cool.

New concealed centrifugal air flow coolant repelling flinger increases bearing life and reduces maintenance expense.

Ask for Catalog No. 57-A and Bulletin No. WA-10, or send us your specifications on the spindles you require.

No. 128

POPE®

ENGINEERS, DESIGNS AND BUILDS PRECISION ANTI-FRICTION BEARING SPINDLES FOR EVERY PURPOSE

POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.

Established 1920

Use postpaid card. Circle No. 230

ASTE TOOL SHOW
April 21-28
Detroit, Michigan

DETROIT * '60 APRIL 21-28
ASTE TOOL SHOW

"Tooling for Productivity" with

Abrasive Equipment

Out of the approximately 500 exhibits scheduled for the 1960 ASTE Engineering Conference and Exhibits, more widely known as the "Tool Show," the editors have selected and summarized for your convenience those that appear to be of greatest interest to you. A product index with the names of the exhibitors and their booth numbers appears at the end of this section.

Advance Products Corporation

Benton Harbor, Mich. **Booth 1738**

Rotary Tables: The Advance 15" rotary table is designed to fill the need for a low- to medium-priced unit combining

precision and high quality. Table has 30-second accuracy, instant worm disengagement, and expansion type brake and lock.

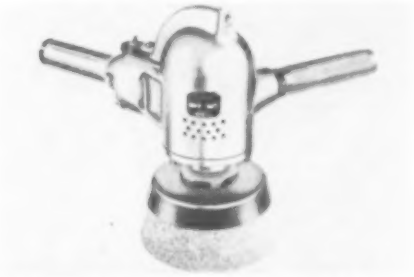
Use postpaid card. Circle No. 31

Airetool Manufacturing Company

Springfield, Ohio **Booth 1734**

Portable Grinder: Perfect for taking down rough spots or for general grinding on either flat or curved surfaces, Airetool's Model 700-V vertical pneumatic grinder has been further improved by the addition of a revolving cup wheel guard. Model 700-V weighs only 11 pounds, uses a 6" wheel or brush.

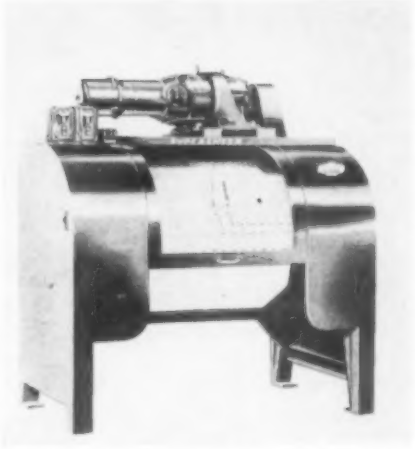
Use postpaid card. Circle No. 32



Almco, Queen Products Division
(King-Seeley Corporation)

Albert Lea, Minnesota **Booth 1626**

Barrel Finishing Equipment: A variety of models of barrel finishing equipment, including two of the new Vibra-Sheen units for vibratory finishing will be on exhibit. Illustrated is Model



DB-200, a 13.8 cu. ft. barrel of the Advanced Design series for deburring and finishing.

Use postpaid card. Circle No. 33

R. B. Annis Company

Indianapolis, Indiana **Booth 719**

Demagnetizers: A combination magnetizer-demagnetizer is being introduced, for use on high permeability materials that require a concentrated

NEW TORIT DIAMOND DUST COLLECTOR SAVES YOU UP TO 30% OF CARAT USAGE; COSTS ONLY $178.50!

Dust from these diamond wheels . . .

was recovered by this Torit Diamond Dust Collector . . .

at the rate of 50.5 carats in 14 days.

exclusive new centrifugal design simplifies recovery, serves all diamond grinding operations

Actually pays for itself in days. In an on-the-job test of this new TORIT equipment, the initial investment was returned in just 21 operating days. The test was conducted by a leading automobile manufacturer under regular operating conditions. Recovery averaged 30% of the carats originally contained in the diamond grinding wheels. You actually get a cash return of $1.00 for every $10.00 invested in diamond grinding wheels.

For all diamond grinding operations. This new TORIT Collector provides the same outstanding performance in all types of grinding operations—mist, wick or dry. Its design and operational simplicity also mean virtually maintenance-free service. Its tough construction assures long, long life.

Installs anywhere. TORIT'S new Diamond Dust Collector can be used alone or in conjunction with central exhaust systems or unit dust collectors. It weighs only 65 lbs. and requires only 14″ x 22″ floor space. Its centrifugal separating action uses no filters or sloppy, inflammable oil baths. Service is quickly and conveniently performed by simply unscrewing the unit's top for removal and emptying of the clear plastic container.

FREE details and full specifications on request. Here's your chance to really save on your diamond usage. Write today for full information on this important new diamond grinding development. Dept. 510

TORIT MANUFACTURING COMPANY 1133 Rankin Street
St. Paul 16, Minnesota

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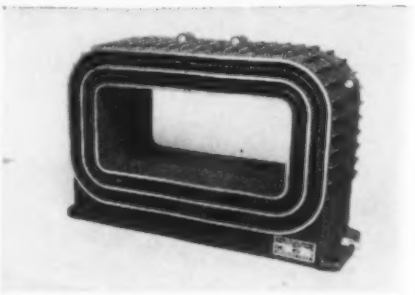
ASTE SHOW . . .

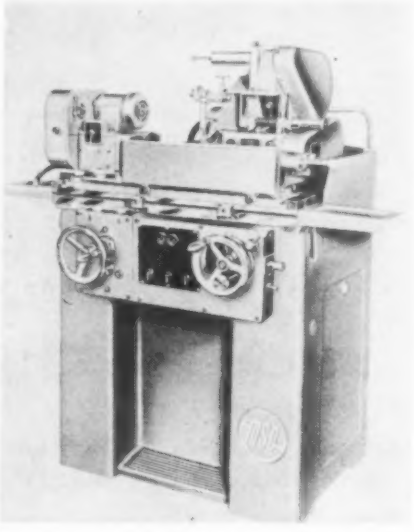


field. A stepped field, surface type demagnetizer that can be hand held or bench mounted is also being shown for the first time.

Use postpaid card. Circle No. 34

Austin Industrial Corporation
White Plains, N.Y. **Booth 1850**

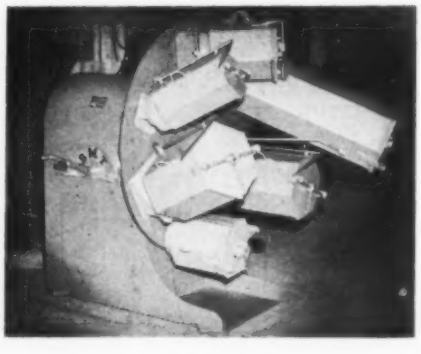
Universal Grinders: Two models of MSO universal grinders, Model FMES (illustrated) and Model FM-750, will



be shown. The first is a precision machine designed for toolroom or medium production work. Capacity is 7″ swing x 12″ grinding length. Internal grinding attachment may be positioned without rotating wheelhead, permitting grinding of OD and ID at one setting. Model FM-750 is similar, with 10″ swing and 30″ grinding length.

Use postpaid card. Circle No. 35

BMT Manufacturing Corporation
Elmira Heights, N.Y. **Booth 2227**

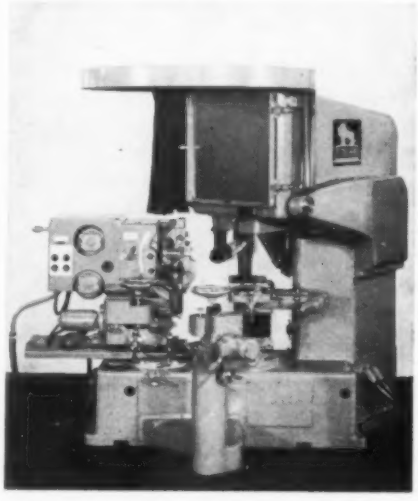


Barrel Finishing Equipment: A number of units for barrel finishing, including multi-barrel machines for slide honing (illustrated) will be in the BMT booth, together with a showing of media, compounds and accessories.

Use postpaid card. Circle No. 36

Eric R. Bachmann Company, Inc.
Long Island City, N.Y. **Booth 1055**

Optical Profile Grinder: Automatic longitudinal and/or cross travel, the newest feature of this machine, permit



fully automatic grinding of flat faces as well as more accurate grinding of irregular profiles. Manual control of the feed in just one direction is the only manipulation left to the operator.

Centerless and cylindrical grinders are also being shown.

Use postpaid card. Circle No. 37

Bausch & Lomb Optical Co.
Rochester, N.Y. **Booth 630**

Toolmakers' Microscopes: The entire line of new StereoZoom microscopes will be featured in the B&L exhibit. Additional new products to be introduced include a new scratch depth gage, die-wear microscope, and a universal staging fixture for both the bench comparator and the standard toolmakers' microscope.

Use postpaid card. Circle No. 38

Bellows-Valvair, Divisions of International Basic Economy Corp.
Akron, Ohio **Booth 1109**

The complete line of Bellows-Valvair products, air-powered devices, valves, and accessories, will be on display.

Use postpaid card. Circle No. 39

Boice-Crane Company
Toledo, Ohio **Booth 744**

Hand Stroke Belt Sander: A new and improved belt sander (illustrated) em-

DYNAMIC POLISHING and DEBURRING

The GRIND-O-FLEX saves valuable production time in polishing and deburring rounded, contoured and flat surfaces. A flexible abrasive wheel that features **slashed** construction, type BL GRIND-O-FLEX practically envelopes the part with dynamic, moving abrasive.

Easy to use, economical, the GRIND-O-FLEX consists of a rugged hub that holds a number of simple-to-replace abrasive pads. No special tools are required to load the hub.

The pads, available in a variety of grits, wear evenly, exposing a continuously fresh abrasive surface.

Write today!.. for illustrated technical bulletin and price list.

MERIT PRODUCTS INC.

First choice is always a product of Merit

3691 Lenawee Ave., Los Angeles 16, Calif.

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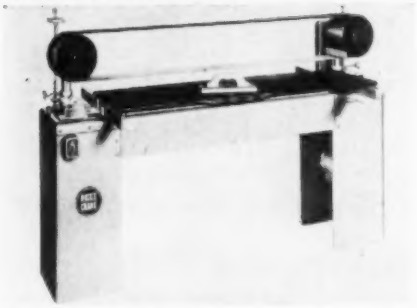
ASTE SHOW . . .



bodies about a dozen important and heretofore unavailable features. It is designed to provide a high finish to flat metal or wood parts up to 36" wide, 60" long, and 4" thick, or to stock up to 12" wide and any length.

Oscillating Spindle Grinder: Scores of metal, plastics and wood finishing problems where contours and vertical surfaces are involved are said to have been successfully solved with abrasive sleeves on the Boice-Crane oscillating spindle grinder. Oscillation is said to improve finish and extend the useful life of the sleeves.

Use postpaid card. Circle No. 40

ATLANTIC WHEELS SPEED UP CUTTING!

A quick pass will tell you! Atlantic Grinding Wheels are *engineered* to float right through those roughest jobs . . . give faster, cooler, cleaner cutting action with less pressure and operator fatigue. Result: increased production. And you keep cutting costs down with Atlantic Wheels.

Atlantic Abrasive Corp.
A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts
STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

Use postpaid card. Circle No. 233

Buckeye Tools Corporation
Dayton, Ohio **Booth 1809**

Portable Air Tools: Main feature at the Buckeye booth will be the new 21K and 21L automation tools, which pro-

vide linear as well as rotary motion. Uses include grinding, wire brushing, drilling, reaming, and similar operations. Introduced in February, these tools will have their first public exhibit at the show.

Use postpaid card. Circle No. 41

Cleveland Industrial Tool Company, Inc.
Chardon, Ohio **Booth 651**

Wheel Dressers: On exhibit will be the Citco automatic dresser and the companion compensating unit for mak-

ing centerless grinding automatic. The dresser takes care of such things as keeping the diamond sharp by turning, turning coolant on and off, and feeding the dresser barrel into the wheel. The compensating unit adjusts for wheel wear either by push button or by automatic control.

Use postpaid card. Circle No. 42

Cleveland Instrument Company
Cleveland, Ohio **Booth 634**

Electronic Gaging Equipment: Items of

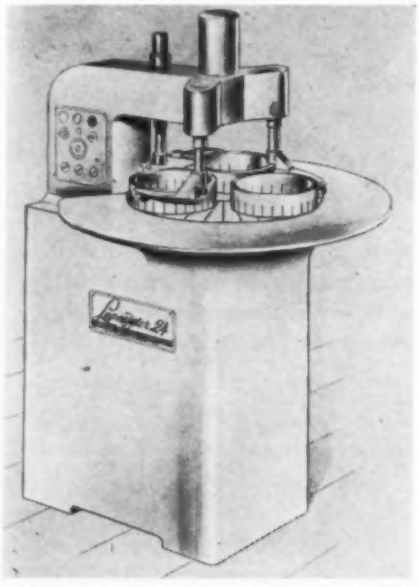
electronic gaging equipment, of which the illustrated Indi-Ac electronic indicator, described as a rugged shop gage with laboratory accuracy, is an example, will be shown and demonstrated at the Cleveland Instrument Co. booth.

Use postpaid card. Circle No. 43

Crane Packing Company

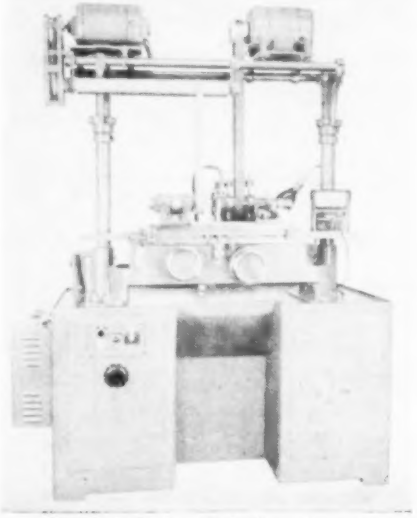
Morton Grove, Ill. **Booth 420**

Lapping Equipment: A new control for automatically checking and maintaining lap plate flatness will be introduced. This electro-mechanical device, featured for the first time on a new Model 24 Lapmaster lapping machine, is said to assure automatic quality control



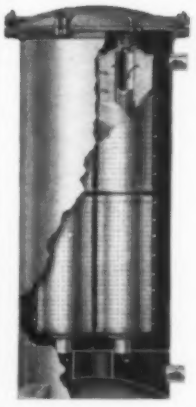
within extremely close tolerances. With the new control, the Model 24 Lapmaster is claimed to lap varied materials on a production basis within tolerances of one light band and microinch finishes of 2 to 3 RMS with uniformity.

Use postpaid card. Circle No. 44



Crystal Lake Grinder (over)

For **SUPER** Finishes you need **SUPER** Filtration...

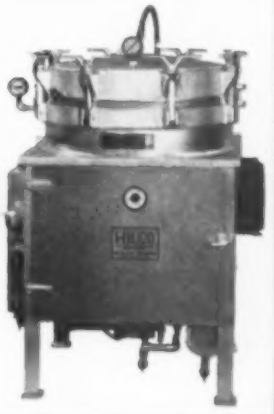


FILTER

Furnished in capacities from 0.1 to 750 gpm. Various cartridges available for mineral and inhibited detergent oils.

OIL RECLAIMER

For complete oil reclaiming. Removes solids, acids and volatile impurities; moisture, solvents, gases, etc. from hydraulic fluids by heat-vacuum process.



That's what you get with

HILCO HYDRAULIC OIL FILTERS

You get complete maintenance of all hydraulic fluids. That means increased production, reduced maintenance cost, reduced oil cost and continuous equipment protection. Only HILCO offers such a wide range of filters and systems engineered for your needs.

Write today for HILCO Bulletin F-132

HILCO CUTS COSTS BECAUSE IT ELIMINATES...

- √ *VARNISH AND SLUDGE DEPOSITS*
- √ *FLUSHING AND MANUAL CLEANING*
- √ *FREQUENT OIL CHANGES*
- √ *ACCUMULATION OF DIRT*

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W. FOURTH ST. • ELMIRA, NEW YORK

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UPTON-BRADEEN-JAMES, LTD.

890 YONGE STREET, TORONTO 8760 VERVILLE STREET, MONTREAL

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ASTE SHOW . . .

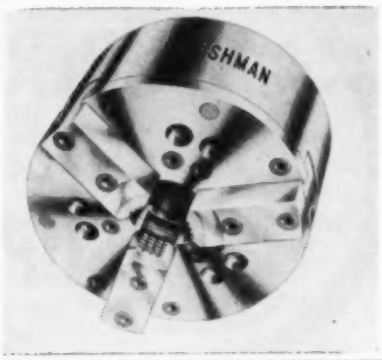
Crystal Lake Machine Works, Inc.
Crystal Lake, Ill. **Booth 361**

Plain and Universal Grinders: The No. 608 plain grinder and the No. 1020 universal grinder will be in the Crystal Lake display. The first, with a 6" swing and 8" center distance, is designed for work from .030" to 2", but will grind from .005" to 5". Standard measuring equipment is a Federal indicator (.00005" reading), but a Federal Electroprobe may be mounted on the machine at an additional charge.

Use postpaid card. Circle No. 45

The Cushman Chuck Co.
Hartford, Conn. **Booth 1021**

Chucker Chuck: A new air-operated chuck designed especially for use on automatic chuckers is being introduced. The Cushman chucker chuck features a small over-all diameter with an exceptionally large bore capacity and an unusually high lever ratio of 6:1.



Use postpaid card. Circle No. 46

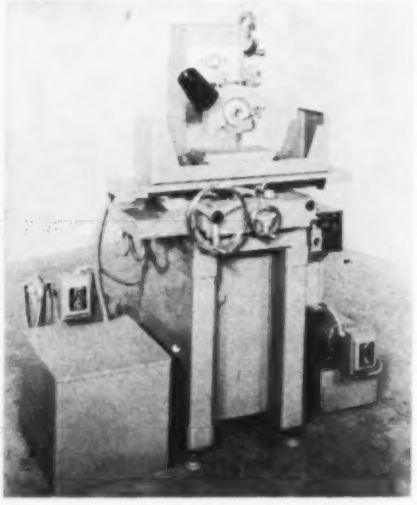
A. G. Davis Gage & Eng. Co.
Hazel Park, Mich. **Booth 706**

Gages and Gage Components: Davis "Sweep" gages are said to represent a totally new concept in concentricity and hole relation gaging. As components, these can be used with specially designed master fixtures to check hole location and numerous other hole and surface relationships. Also shown for the first time will be a new series or Omni-Gage multi-purpose indicator gage components, for a variety of short-run or production gage problems.

Use postpaid card. Circle No. 47

The DoAll Company
Des Plaines, Ill. **Booth 1226**

Surface Grinder: Model DH-612, to be displayed, is said to be the most versatile hand grinder in DoAll history. Operating either manually or hydraulically, it can double on either toolroom or production runs. This model grinds to "tenth" accuracy from handwheel calibrations.



Gage Blocks: New stainless steel gage blocks will also be shown.

Use postpaid card. Circle No. 48

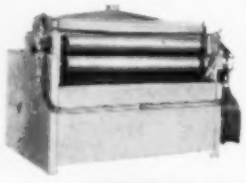
Engelhard Industries, Inc.
(Industrial Diamond Division)
East Newark, N.J. **Booth 2144**

Diamond Grit: New SND natural diamond grit will be highlighted in this display. In contrast to conventional diamond grit, the newly offered abrasive contains a preponderance of needle-like particles which are shown to in-

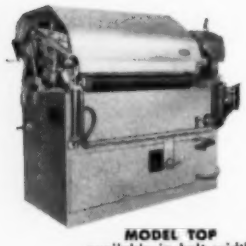
"Only machine capable of handling our rugged and precision sanding requirements on large aluminum panels"*

*Reported by
N. B. Barsha, Plant Engineer
Cupples Products Corp.
St. Louis, Mo.

TIMESAVER SPEEDBELT SANDERS



MODEL SPL
available in belt widths of 24", 36" and 50"
Sanding action is for underside of work.



MODEL TOP
available in belt widths of 24", 36", 50" and 54"
Sanding action is overhead.

"We were faced with the problem of sanding 1000 vertical aluminum panels, 28'x24"x3/16" for the exterior of the new U.S. Air Force Academy buildings. These panels required finishing to a uniform and precision surface specification. Before we purchased the Timesaver Model TOP-50, we thoroughly investigated the market for sanding machines of this type. The Timesaver "Speedbelt" was the only unit which possessed the durability, accuracy and rugged construction necessary for our requirements."

The Cupples Products Corporation's experience is typical of Timesaver "Speedbelt" Installations throughout the country . . . where performance and need to achieve production and cut costs is important. They can do all flat metal surface finishing, polishing and sanding formerly assigned to other methods . . . and do them better. What's more, savings made in labor, materials and maintenance soon pay for their low initial cost.

Investigate the advantages of Timesaver Sanders for your plant, write for literature and information today.

TIMESAVER SANDERS
Dept. R-6
P.O. Box 7446, Robbinsdale Station • Minneapolis 22, Minn.
Pioneers in Wide Belt Sanding for the Woodworking Industry

Use postpaid card. Circle No. 235

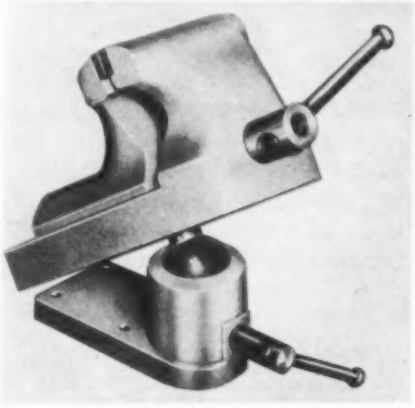
crease grinding efficiency in certain types of applications. Conventional natural diamond material will also be featured.

Use postpaid card. Circle No. 49

Engis Equipment Company
(Hyprez Division)

Chicago, Ill. **Booth 1465**

Vises: The Engis tilt swivel vise, which swivels through 360° of arc and tilts 30° up or down in any position, is available in two sizes and is said to be ideal for all finishing operations.



Use postpaid card. Circle No. 50

Federal Products Corporation
Providence, R.I. **Booth 1000**

Air-Electric Control Gages: A compact control unit for air-electric machine control gages, which incorporates all of the elements formerly housed in three separate enclosures will be demonstrated in actual use. By using transistors and re-designing the wiring,

the unit now contains more equipment, yet occupies just a quarter of the space formerly needed. The use of transistors also means that these components will have a much longer life, and consequently fewer shutdowns for replacement. Also displayed will be air-electric gages for internal grinders, and a miniature grinding gage for small diameters.

Use postpaid card. Circle No. 51

Grinding operation, dust control piping overhead.

No two dust control problems are alike!

Grinding operation, dust control "down draft" under floor.

Since no two dust control problems are alike, a Kirk and Blum engineering survey determines the exact nature of *your* specific application. It's all part of K & B's *complete* service to assure you the best system for your particular need, all factors considered.

From survey time until the system is completed and in operation, Kirk & Blum handles the entire job with one undivided responsibility . . . a condition only possible when you have *one* source for all service, *one* guarantee for all components.

Write today for the new 52-page K & B Catalog or a no-obligation survey of your particular problem. The Kirk & Blum Mfg. Co., 3124 Forrer St., Cincinnati, 9, Ohio.

KIRK & BLUM

Complete Dust Control Systems

Use postpaid card. Circle No. 236

ASTE SHOW . . .

Hammond Machinery Builders, Inc.

Kalamazoo, Mich. **Booth 1027**

Tool Grinder: The new Hammond Model CME-66 chip breaker and oscillating cup wheel grinder will be introduced and actively demonstrated.

The machine is built and priced for low- or medium-volume tool grinding, provides oscillating cup wheel grinding on one end, chip breaker grinding on the other. Other tool grinders and abrasive belt grinders will also be demonstrated.

Use postpaid card. Circle No. 52

Harig Manufacturing Corp.

Chicago, Ill. **Booth 1045**

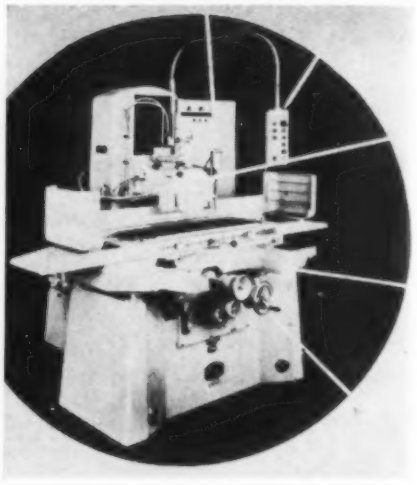
Fixtures: A new and improved Grind-All fixture will be on display, together with carbide and steel dies, and surface grinders.

Use postpaid card. Circle No. 53

Hermes Machine Tool Co., Inc.

Long Island City, N.Y. **Booth 151**

Surface Grinder: The Blohm horizontal surface grinder, Model HFS 9, equipped to grind automatically to within less than 40 millionths of an inch tolerance,



will be featured. The machine has 16" to 36" grinding capacity with 24" from spindle center to table top and a 7.5 HP direct drive spindle motor. This is the first U. S. showing of a Blohm grinder with this equipment.

Use postpaid card. Circle No. 54

E. F. Houghton & Co.

Philadelphia, Pa. **Booth 135**

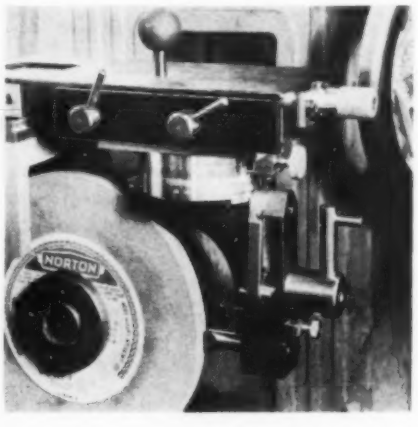
Metal Cleaners: "Cerfa-Kleen," an entirely new series of production line cleaners, will be displayed for the first time. According to the supplier, the four compounds in the line are tailored to the exact requirements of basic industrial metal cleaning processes; hot and cold power washers and soak tanks. They contain no free caustic and incorporate several new and improved properties.

Use postpaid card. Circle No. 55

J & S Tool Company

Livingston, N. J. **Booth 2116**

Wheel Dresser: The "Fluidmotion" wheel guard dresser is adaptable to quills of 3" to 3½" diameter, includes an inverted base with compound micrometer lead screws for maintaining the position of a formed grinding wheel in relation to the work. It is adaptable



NOW 7* STANDARD LAPMASTERS

FOR PRECISION LAPPING
to a flatness of .0000116" or less with a micro-inch finish of 2 to 3 RMS. All Lapmasters will maintain this uniform accuracy piece-after-piece because conditioning rings continually condition the lap plate during entire lapping cycle.

IN SMALL LOTS OR THOUSANDS PER DAY
with consistent accuracy. Production is not interrupted or slowed down for replacing or reconditioning lap plates.

OF PARTS UP TO 32" DIA.
and as small as ⅛" dia. Accurately laps paper-thin pieces as well as giant two-ton parts.

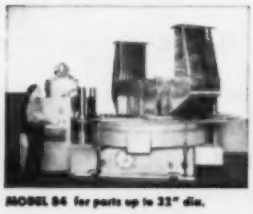
OF ANY SHAPE, FORM OR MATERIAL
tall or squat, long or short, flat or odd shaped . . . any metal, ceramics or plastic all at the same time if necessary. Inexpensive work holders eliminate danger of stresses and warping usually caused by clamping during grinding or milling.

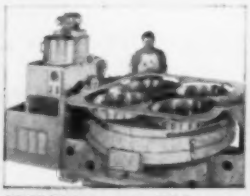
*For your special lapping requirements, we will build Lapmasters any size.

MODEL 10 for maintenance lapping of parts up to 3-11/16" dia.

MODEL 12 for parts up to 4" dia.

MODEL 24 for parts up to 9½" dia.


MODEL 84 for parts up to 32" dia.


MODEL 72 for parts up to 27" dia.

MODEL 36 for parts up to 14½" dia.

WRITE FOR THE COMPLETE LAPMASTER STORY
Write for bulletins describing the Lapmaster line and chart on measuring flatness.

MODEL 48 for parts up to 17" dia.

Lapmaster . . . THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

A product of
Crane Packing Company
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APRIL, 1960

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ASTE SHOW . . .

to 7" or 8" wheels, may be used with the present model "F" "Fluidmotion" wheel dresser on 7" wheels. Also included are a straight diamond dresser and corner chamfering unit; adjustable downholding vise jaws, and a compact machine for cutting contact lenses.

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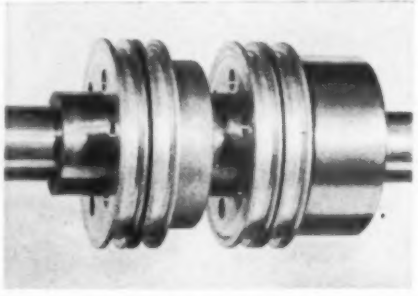
Koebel Diamond Tool Co.

Detroit, Mich. **Booth 1623**

Diamond Wheel Dressers: Cemented diamond particle cutters will be featured. According to the company, major advantages to be gained from using the CDP cutter process include no downtime for wheel dressing; up to 25% more pieces per wheel; freer wheel cutting action; less temperature rise in part; closer tolerances consistently maintained; and surface finishes to 30 RMS.



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Paul L. Kuzmick Company

Verona, N.J. **Booth 1825**

Diamond Grinding Wheels: The display of the Paul L. Kuzmick Company will include resinoid, metal, and vitrified bonded diamond grinding wheels, together with a variety of finished carbide tools accompanied by reports of grinding cost reductions engineered by Kuzmick abrasive engineers. Hand ground carbide burr demonstrations will also be given in the booth.

Use postpaid card. Circle No. 58

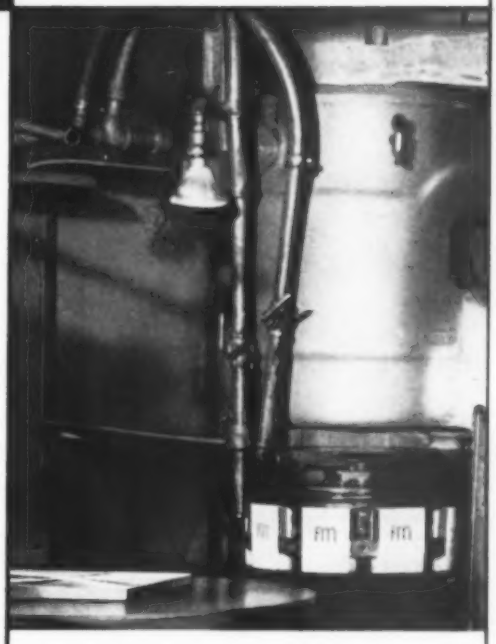
K. O. Lee Company

Aberdeen, S. D. **Booth 1431**

Surface Grinder; Bench Center and Surface Plate: The Model S612 surface grinder and a Model BC3 precision bench center and surface plate will be on display. Both are recent developments. The first is described as a low-cost precision grinder designed to handle most of the work ordinarily handled on larger machines. The second is claimed as an accurate means of inspecting all types of work, with the

THANKS TO FM SEGMENTS . . .

Earl Poiner, Owner
Curtis Steel Supply Co.
Akron, Ohio



"MY COSTS ARE DOWN . . . QUALITY AND PRODUCTION UP!"

"My business is contract surface-grinding . . . a tough, highly competitive business . . . and a field where success or failure often depends on the quality of the segments used. That's why we now use only FM segments in our shop.

"We're specialists, so we get the toughest jobs. And we **have** to demand top performance from our segments if we're to keep ahead of competition. Thanks to FM, we **are** keeping ahead . . . by keeping our costs down and our quality and production up."

Curtis Steel Supply Company is a leading contract surface-grinding firm in the Akron area, with some of the biggest names in the automotive, aircraft, missiles, and rubber industries as customers. Its work ranges from the smallest gear blanks to giant steam platens . . . jobs that require the highest degree of precision grinding. Consistent quality, fast stock removal, and versatility are "musts" for segments at Curtis. We are proud that Curtis has selected FM segments over all competition to help meet its high performance standards.

If fast, precision grinding figures in **your** cost and profit picture, contact your FM supplier today. Or send us your job specifications. Quick delivery of all standard segment shapes!

Free Grinding Wheel Selector on Request

VITRIFIED AND RESINOID ABRASIVE GRINDING WHEELS AND SEGMENTS

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THE FULLER MERRIAM COMPANY
70 WATER STREET • WEST HAVEN, CONNECTICUT

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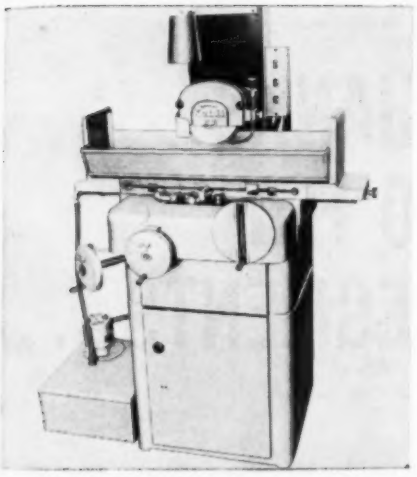

work pieces mounted between centers, in V-rests, or on precision ground surface plates.

Use postpaid card. Circle No. 59

M & M Tool & Mfg. Co.

Dayton, Ohio **Booth 1265**

Fixtures: Roto-Grind, an internal-external fixture for every surface grinder into a power rotary grinder. It will fit on a jig grinder for grinding large rings, off-set holes, radii, and contours. Up to 20 millionths accuracy is claimed when grinding a 10" diameter plate. It can also be set up vertically for internal or external grinding.

In no time at all, you can install a Sundstrand Coolant Separator

...to improve grinding honing and gear shaving

Permanent Alnico magnet drum revolves against coolant flow . . . attracts and separates magnetic particles quickly and easily. Separated material is removed from the drum by a scraper and deposited in an easily removed receptacle or sludge pan. Sludge pan can be removed for cleaning in a few seconds. No tools are required.

Sundstrand magnetic coolant separators set right into open coolant tanks on most machines . . . no repiping or fitting necessary. Once the separator is in place, you simply connect the drive motor wiring and you're in business. The entire installation takes maybe an hour or less and then your savings start immediately: Reduced down time and lower coolant costs (no sump cleaning), improved surface finishes, longer wheel life, and fewer rejects. Four capacities: 25, 50, 75, and 100.

Bulletin No. A-364 gives complete data . . . write for your copy today.

MARK OF SUNDSTRAND RELY-ABILITY

POWER-GRIP

SUNDSTRAND-AMERICAN BROACH

MAGNETIC DEPT., ANN ARBOR, MICHIGAN

Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 239

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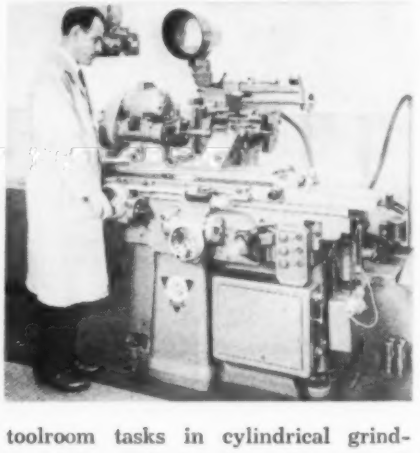
Micromatic Hone Corporation

Detroit, Michigan **Booth 1816**

Cylindrical and Surface Grinders: This display will include a number of cylindrical and surface grinders in their first U. S. display other than an in-plant show last November. Model 1215 (illustrated) is a high precision machine suitable for the more difficult



toolroom tasks in cylindrical grinding. Other cylindrical grinders include Model 1212, 5" x 12" capacity, a hand-operated machine for grinding small batch work to extreme accuracy; Model 540 hydraulic surface grinder, 6" x 18" capacity; and Model 1400 surface grinder, 8" x 24" capacity.

Use postpaid card. Circle No. 61

Modern Industrial Engineering Co.

Detroit, Michigan **Booth 1818**

Gear Grinders: A single station hypoid ring gear relief grinder features this exhibit. The machine is used to eliminate points of interference after the lapping operation with the pinion at both the heel and toe ends of the ring gear. Also to be shown at the booth are three models of the Burr Master line for deburring and chamfering of gears.

Use postpaid card. Circle No. 62

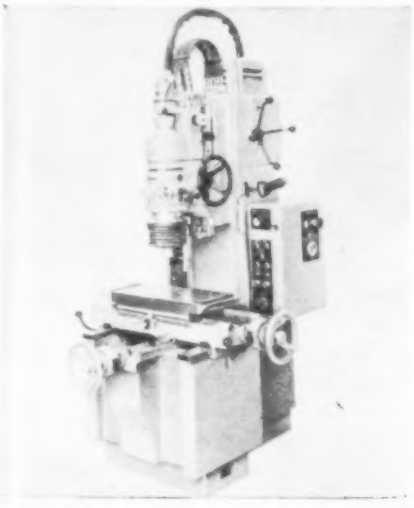
Moore Products Co.
Philadelphia, Pa. **Booth 124**

Pneumatic Gages. The new Moore jump-on gage will be demonstrated, along with other pneumatic comparator gages for manual and automatic operation. The jump-on gage is a completely sealed component with tungsten carbide contact shoes and provision for fine adjustments. Operation is entirely pneumatic, eliminating bulky JIC limit switches. The gaging head requires minimum space.

Use postpaid card. Circle No. 63

Moore Special Tool Co.
Bridgeport, Conn. **Booth 1105**

Jig Grinder: Model No. 3 Moore jig grinder makes possible finer tolerances, plus a greater range and larger table,



than its predecessor models. It will grind, to split-tenth accuracy, straight or tapered holes, regular or irregular contours. Features of this newest model include hardened, ground, and hand-lapped steel ways; infinite spindle speeds from 40 to 250 rpm; table work-surface of 11" x 24" with 18" height allowance; and JIC conformity.

Use postpaid card. Circle No. 64

Oakite Products, Inc.
New York, N.Y. **Booth 930**

Cleaning Materials: Cleaning methods and materials designed for modern production techniques will be exhibited. Included in the display will be the newest developments in conversion coatings for aluminum and steel; electro-cleaning; ultrasonic cleaning; barrel finishing; rust removal and prevention, and protection against rust in automatic spray machines; paint stripping.

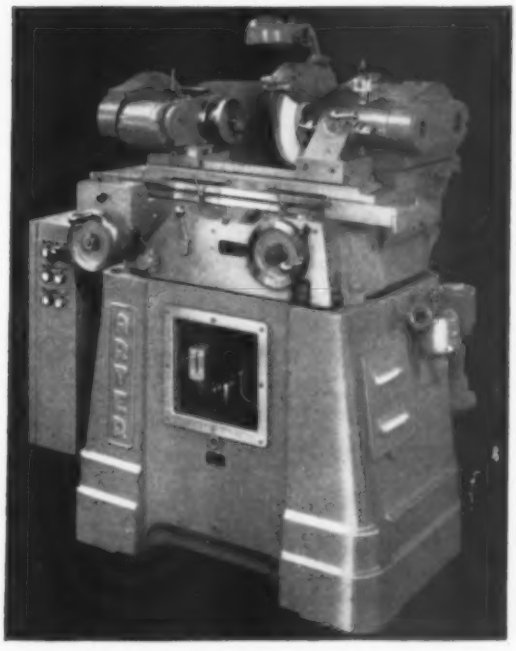
Use postpaid card. Circle No. 65

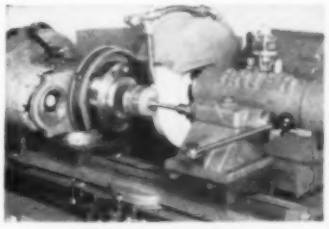
Olivetti Corporation of America
Long Island City, N.Y. **Booth 1660**

Cylindrical Grinders: An Olivetti 10" x 15" automatic production grinder will be exhibited under power. It is the first of this type to be publicly shown. Model R4-300P/Y is a high precision, fully automatic cylindrical grinder which, it

You can do external and internal grinding

...with one Sundstrand model 103 precision grinder





External grinding head arranged for cylindrical grinding of gear diameters. Swiveling workhead converts external grinder to cutter grinder.

Internal grinding head replaces external head, provides spindle speeds up to 32,000 rpm for work such as arbor support bushing shown.

The Sundstrand Model 103 grinder with interchangeable wheelheads will lead the way to bigger savings in your shop. It is ideal for toolroom or production work where a small-capacity machine is needed or for supplementing larger grinders when work piles up. Work table, wheel-head, and headstock swivel for angular grinding jobs . . . multiple jaw chucks, faceplates, and other chucking accessories can be quickly attached to spindle nose for even greater versatility and a wider range of work applications. For complete information on this double-duty grinder, write for Bulletin A364

MARK OF RELY-ABILITY
SUNDSTRAND ARTER

SUNDSTRAND MACHINE TOOL
BELVIDERE, ILLINOIS
Division of SUNDSTRAND CORPORATION

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is said, can be pre-set to grind within 50 millionths to a positive stop, without requiring "in-process" gaging to do so. Model R4-500U, a universal semi-automatic 10" x 24" cylindrical grinding machine will also be exhibited.

Use postpaid card. Circle No. 66

The Osborn Manufacturing Company

Cleveland, Ohio **Booth 1305**

Metal Finishing Machines: Metal finishing machines designed for use in either semi-automatic or completely automated production cycles will be the keynote. The Osborn exhibit will be the first public display of its "building block" concept, as applied to metal finishing machines. All individual components on these machines are interchangeable, which means that each machine can be readily adapted to specific manufacturing requirements.

Use postpaid card. Circle No. 67

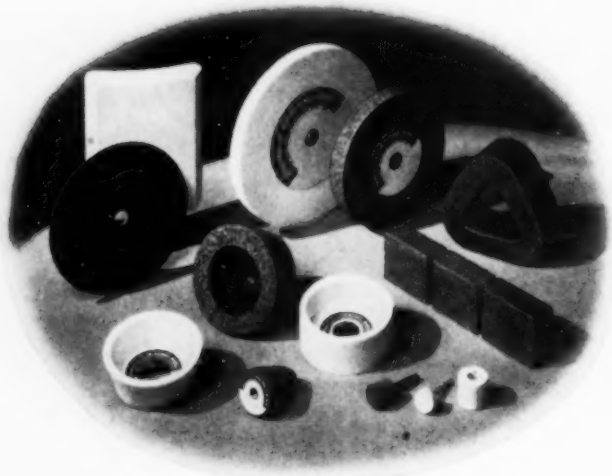
Precise Products Corporation

Racine, Wisconsin **Booth 127**

Power Quill: New power quills (illustrated) will be demonstrated running at constant speed under load in a range from 7,200 rpm to 54,000 rpm. Power output at the chuck up to 2 hp. Three basic models, fully interchangeable with the company's universal motor power quills.

Electric Jig Grinder: New high torque electric unit is said to convert any good vertical milling machine to a precision electric jig grinder. Three basic models will be shown.

For three score years and more...



. . . cost conscious buyers of production grinding wheels have been specifying "American" on their purchase orders knowing they would get wheels of uniform quality and performance . . . wheels that had been individually engineered to do their particular job more economically and efficiently . . . wheels that were exactly the same every time they were ordered regardless of shape — size — structure or quantity.

"American" offers wheels in every size and shape and for every purpose for which a grinding wheel is used. Every wheel is tested for true running qualities, strength and balance. Exact duplication is assured through the use of the most modern electronic and mechanical testing devices.

And "American" gives you a personal service by trained men . . . men who have dedicated themselves to the satisfactory solving of any and all production problems where grinding wheels are used.

There is an "American" man near you — call him or write for illustrated brochure to

"American" EMERY WHEEL WORKS

5 RED BRIDGE, PROVIDENCE 1, RHODE ISLAND

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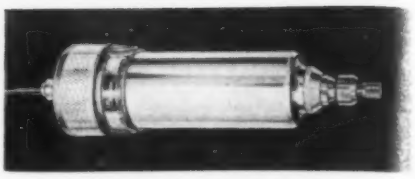
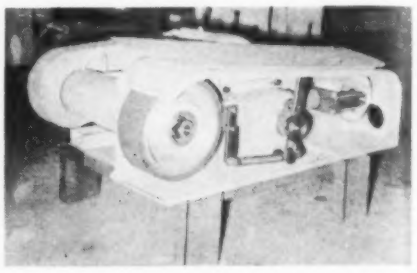


Use postpaid card. Circle No. 68

Production Machine Company

Greenfield, Mass. **Booth 192**

Abrasive Belt Grinding Attachment: A new abrasive belt grinding attachment will be exhibited for the first time. An entirely new design, it is built for mounting on heavy duty lathes, mills, planers, or similar machine tools. The unit is capable of heavy stock removal,



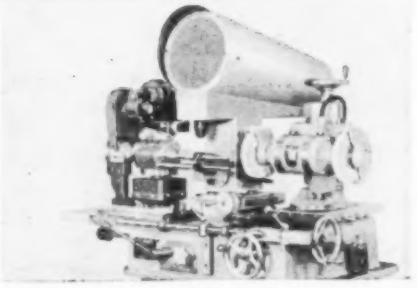
close-tolerance size control, and accuracy limited only by the machine on which it is installed. Uses contact wheel 12" diameter, and belts up to 4" wide, 86" long.

Use postpaid card. Circle No. 69

R-O Manufacturing Company

Madison Heights, Mich. **Booth 560**

Optical Comparator: A new precision optical comparator for mounting on R-O grinders in conjunction with the R-O universal form relieving fixture is to be shown for the first time. Although the R-O will be shown as a complete unit, individual components



may be purchased separately. The comparator is equipped with a 20X magnification lens, swings in and out of position for checking progress of grind without disturbing set-up. Shown for the first time will be a horizontal measuring device which mounts on the grinder and permits faster positioning of the tool to the wheel.

Use postpaid card. Circle No. 70

The Sheffield Corporation
(Subsidiary of Bendix Aviation Corp.)
Dayton, Ohio **Booths 405, 500**

Air Gages: Visitors to Sheffield Booth 500 will see a large number of Precisionaire® dimensional comparators and adjustable air gage tooling and fixtures, electronic inspection instruments, air-to-electric automatic machine controls, and an automatic post-process gaging machine. The air gage recorder (illustrated) is one of these products being introduced at the show. An in-the-press Press Pacer® transfer unit will be demonstrated in Booth 405.

Use postpaid card. Circle No. 71

Size Control Co.
(American Gage & Machinery Company)
Chicago, Illinois **Booth 238**

Micrometer Checking Device: Newest in a series of micrometer checking devices developed by Size Control in 1959 is the Dept-Mikemaster®, created to assure the accuracy of depth mikes. It features a display including a wide sampling of Size Control precision gages.

Use postpaid card. Circle No. 72

Spitfire Tool and Machine Co.
Chicago, Illinois **Booth 552**

Lapping Machines: A number of precision flat and cylindrical lapping machines, including the newest, a 36" Gyro-Matic flat lapping machine (illustrated) will be featured in the Spitfire booth. Designed for high production of small, medium, or large parts, the illustrated machine is said to be extremely versatile, highly reliable. It is available with or without hydraulic lifts. Optical flatness to one light band.

Use postpaid card. Circle No. 73

The Standard Electrical Tool Company
Cincinnati, Ohio .... **Booth 1430**

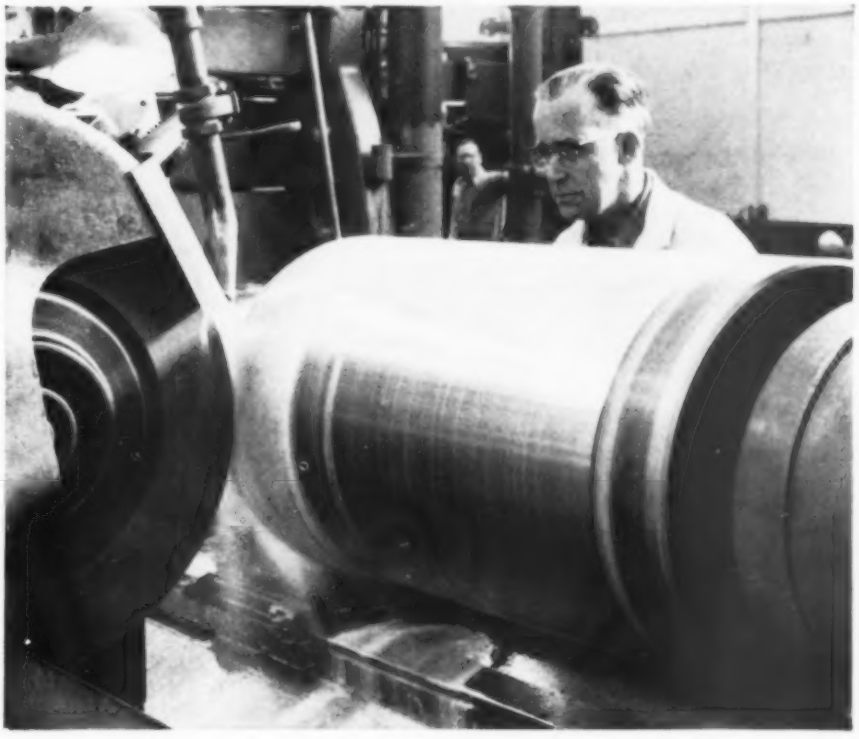
Conversion Units for Electrically-Aided Grinding: A number of recently-developed units for converting basic grinders to electrically-aided grinding will be on display. These will include equipment for cylindrical grinders, tool and cutter grinders, and surface grinders.

Use postpaid card. Circle No. 74

Sunnen Products Company
St. Louis, Mo. **Booth 1155**

Internal Honing Equipment: A new series of honing tools for bores with keyways or splines will be introduced. (See illustration.) These double the diameter range of previous tools and require only a fraction of former truing time. Also on display will be a heavy-duty cylinder hone, a new line

Where the wheel meets the steel . .



"Jobs change—but coolant doesn't with W&B E-55 in this Norton Grinder!"

"We can never tell what tough job is coming up next in this cylindrical grinder," says Mr. Ellis E. Carlson, Jr., General Foreman of Norton Company's Central Service Department. "It may be stainless (like the job shown here) or any number of nonferrous metals, alloys or steels.

"We do know that, no matter what the metal, W&B Grinding Coolant E-55 will do the job! It gives us good cooling; keeps the wheel clean and free cutting. And we don't have to clean the tank as often.

"On top of that, E-55 doesn't foam; settles chips fast; and gives good rust protection. It makes a clean, transparent coolant that doesn't smell bad and is easy on the hands." What more could you ask?

Send for a FREE working sample of W&B E-55! Write coolant tank size, plus make and type of grinder and typical jobs . . . on company letterhead. Mail to The White & Bagley Co., 88 Foster Street, Worcester, Mass.

W+B INDUSTRIAL LUBRICANTS

THE WHITE & BAGLEY CO.
Worcester, Massachusetts • Detroit, Michigan
Originators of Grinding Lubricants

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ASTE SHOW . . .

of small-bore tools for holes as small as .100" diameter, and the latest models of Sunnen hole gaging and measuring equipment.

Use postpaid card. Circle No. 75

Threadwell Tap & Die Company

Bloomfield, Conn. **Booth 2154**

Internal Grinding Head: An air turbine grinding head on which the radial feed can be adjusted without stopping the machine will be featured. This Grind-A-Matic unit can be mounted on a

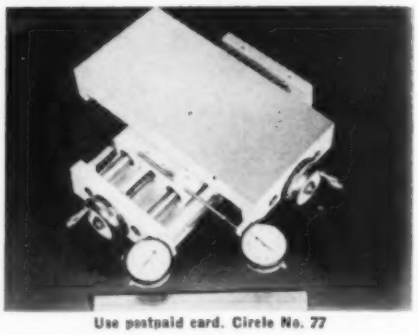
jig borer, lathe, drill press or comparable machine tool, is said to offer many of the advantages of a jig grinder at less cost. It is recommended for close-tolerance toolroom work on dies and fixtures, as well as for many production jobs.

Use postpaid card. Circle No. 76

Tracer Control Company

Hazel Park, Mich. **Booth 2220**

Attachments: In this display will be shown an "E" Series Duplimatic tracer attachment, designed to automate basic machine tools for automatic and pencil trace machining. Also exhibited will be a new two-way adjusting compound (illustrated) for precision holding and locating of work pieces.



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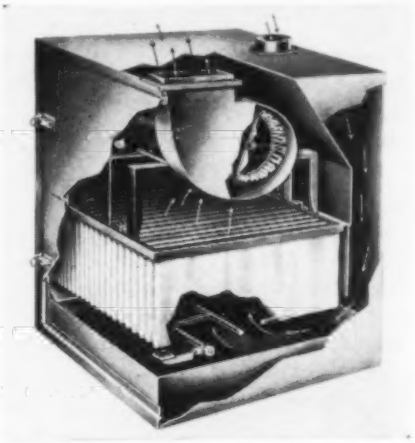
Torit Manufacturing Company

St. Paul, Minnesota **Booth 736**

Dust Collectors: Three types of dust collectors will be highlighted in the Torit display. The cabinet cloth filter type (illustrated) is claimed to remove better than 99% of the dust in typical grinding operations. These compact,



self-contained units are designed for use where gritty dust must be removed. A new diamond dust collector, tests show, recovers $100 for every $1000 invested in diamond wheels. Cyclone separator-type collectors, for use where large volumes of dust must be handled, will also be shown.

Use postpaid card. Circle No. 78

O. S. Walker Company, Inc.

Worcester, Mass. **Booth 2242**

Rotary Chuck: A new rotary permanent ceramic magnetic chuck will be introduced. The chuck is so powerful magnetically that it can be used safely for lathe work as well as for grinding. A special "lock" safety feature insures

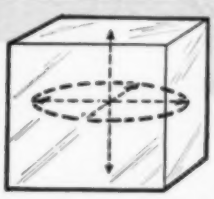
TRAVATROL

Electronic Traverse Control

TRAVATROL is a linear measuring and positioning control, providing accuracy and convenience. Operates from a single phase current supply. A wide range of models available, complete packaged linear positioning control, with variable speed D. C. motor drive, three dimensional position systems available. TRAVATROL systems offer remote control for air, hydraulic or electric valves and tracer systems.

Remote controlled linear travel reduces costly mechanical set-up time and eliminates manual readjustment of the limiting region.

TRAVATROL establishes and maintains a minimum distance of travel allowing point to point positioning over the entire traverse range. Controls for reciprocating members are equipped with dual adjustments for minimum and maximum travel range.



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A self contained unit operating from an alternating current source, providing full wave direct current combined with extremely versatile magnetic chuck control. Saves operator's time; speeds up production by quick and complete release of work. Provides means of retaining residual magnetism when desired.

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positive holding under the most rapid start and stop conditions. Variable holding power is provided for easy work positioning. No electrical accessories are necessary.

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Wheelabrator Corporation

Mishawaka, Indiana **Booth 861**

Mechnical Deburring Equipment: Four different processes for deburring by mechanical methods will be demonstrated in the booth: Wheelabrator deburring, the Lorco vibratory method,

Liquamatte wet blast, and Techline barrel deburring. The first two processes are being introduced at the show, and three of the four have been modified significantly during the last year.

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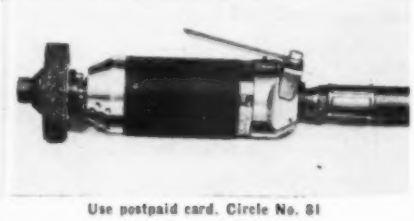
Thomas C. Wilson, Inc.

Long Island City, N.Y. **Booth 1657**

Small-Wheel Pneumatic Grinder: Pneumatic grinders with a choice of ten operating speeds, for driving small grinding wheels, sanding and cutting discs, and carbide burrs, will be featured. These series 921 grinders are intended for burring, die grinding and contouring, flash removal, weld smoothing, and similar operations. Speeds range from 16,000 to 25,000 rpm. Available in spindle or collet chuck models with lever, pushbutton, or ring-throttle control.



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Winslow Product Engineering Corporation

Arcadia, Calif. **Booth 1165**

Automatic Drill Pointer: A precision drill point grinding machine for pointing

drills from .032 thru 1.50 diameters in an automatic cycle will be displayed. Known as the Model 100 Winslow-Matic drill pointer, the machine produces various types of points, can also grind the drill point on most drill countersinks. Four different workheads are available, can be quickly changed.

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N. A. Woodworth Company

Detroit, Mich. **Booth 1351**

Work-Holding Devices: Two new developments in work holders will be featured. One is the new "Ball Lok" power chuck, introducing ball joint actuation to replace the conventional "T" slot design. The second is a retractable air coupling for power chucks, with self-contained air cylinder and through feed spindles.

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Herbert Harig, president, and Karl Harig, chairman, Harig Manufacturing Corporation, Chicago, examine tenth-splitting accuracy from their No. 3 Moore Jig Grinder (left) and No. 3 Moore Jig Borer.

"We're now splitting tenths, thanks to Moore's new No. 3 Jig Borer and Jig Grinder"

Made and calibrated to the New International Inch.

"Our operators feel these are the best machines they have ever worked on... They take care of the tenth-splitting tolerances required by industry today."

These are the words of two of America's acknowledged tooling leaders, active heads of one of America's foremost independent producers of accurate dies—carbide, lamination, progressive, and other precision tooling.

Says Herb Harig, president of Harig Manufacturing Corporation and former president of National Tool & Die Manufacturers Association: "Moore's line of Jig Borers and Jig Grinders has been an integral part of the development of our company from 15 employees in 1937 to 120 today. We have always been among the first to install each new model. That's why we are among the first with Moore's tenth-splitting No. 3 Jig Borer and No. 3 Jig Grinder. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines!"

Sums up Chairman Karl Harig: "When owner-management invests its money in machinery, it does so only after thorough analysis and careful selection. I don't know of any machine manufacturer which meets both these tests better than does Moore."

We stand ready to help you duplicate Harig's record of satisfaction. As a start, write today for our detailed literature on these new tenth-splitting machines with larger tables; hardened, ground and lapped ways; no gibs, no overhang.

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PRODUCT INDEX

Product	Booth No.
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M & M Tool	1265
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Barrel Finishing Media, compounds	
BMT Mfg. Corp.	2227
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Bench Center	
Lee, K. O.	1431
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DoAll	1226
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Sunnen Products	1155
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Gages, optical	
Bausch & Lomb	630
R.O. Mfg. Co.	560
Gages, pneumatic	
Federal Products	1000
Moore Products	124
Sheffield Corp.	500

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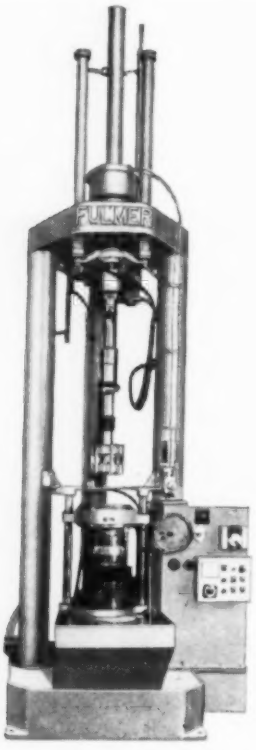

Honing machines, unlike most machine tools, do not require massive weight and rigidity to maintain accuracy. Fulmer designers recognize this basic concept by "beefing up" their machines only where it counts . . . with heavy-duty oversize spindles, bearings and gear train . . . the vital working parts. Functionally designed Fulmer Honing Machines save you money by eliminating needless masses of high-priced cast iron and steel . . . they weigh less, cost less.

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Product	Booth No.
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Boice-Crane	744
Hammond	1027
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Production Machinery	1922
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Bachmann, Eric R.	1055
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Olivett	1660
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Pangborn	2231
Wheelabrator	861
Work Holders	
Advance Products	1738
J & S Tool	2116
M & M Tool	1265
Tracer Control	2220

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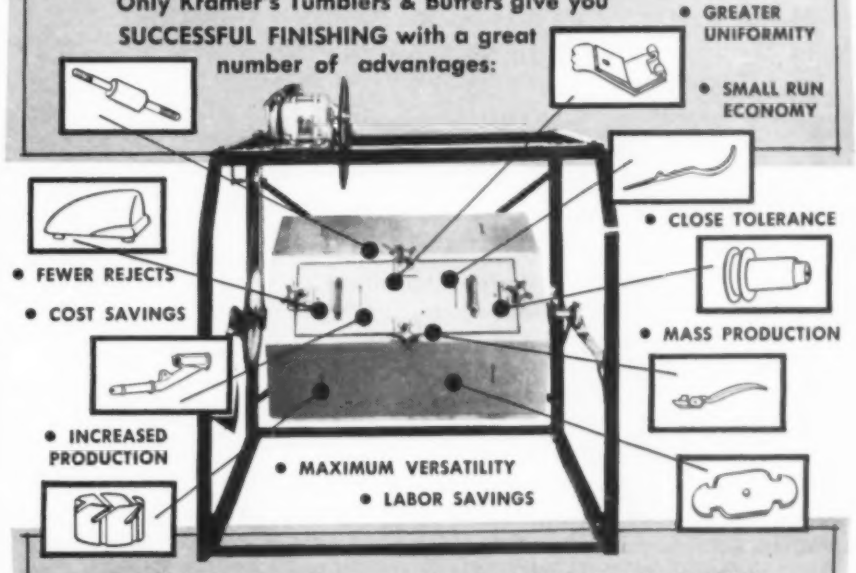

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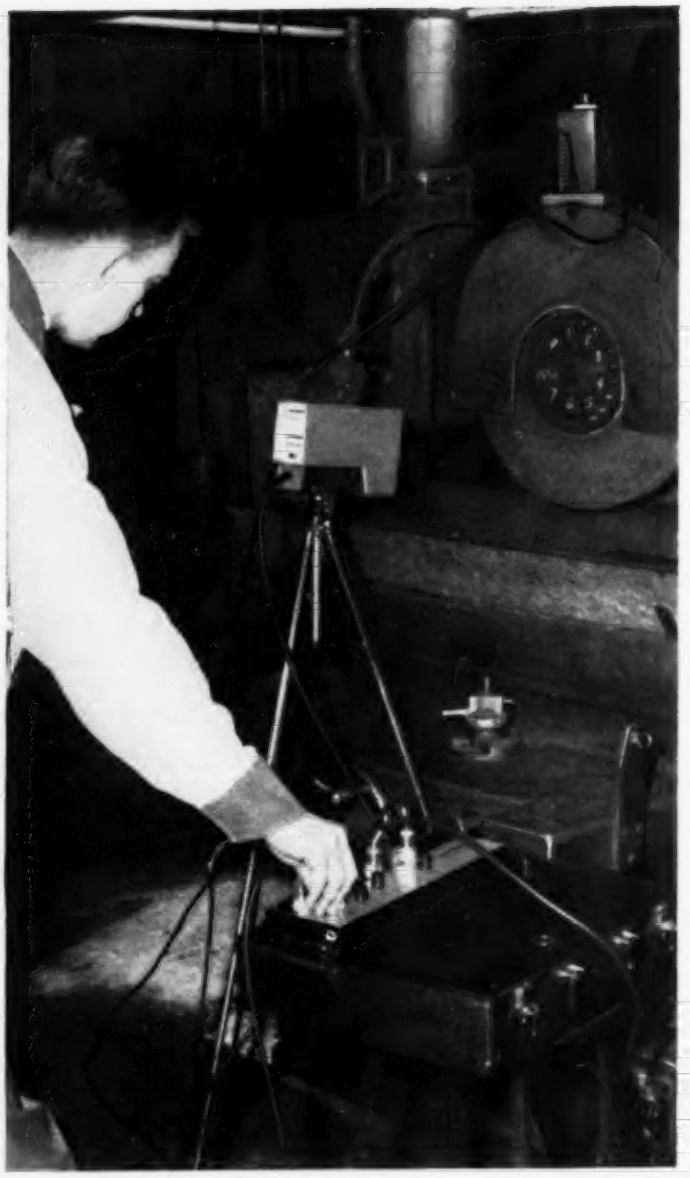
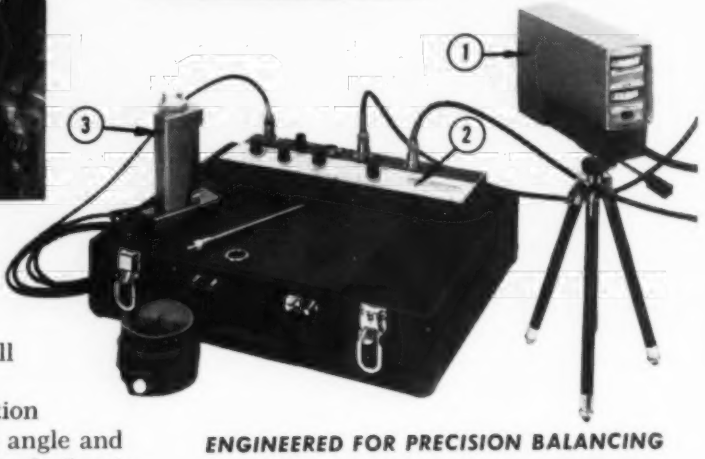


New Stewart-Warner Portable Balancer balancing grinding wheel

now! PRECISION GRINDING WHEEL BALANCING

priced for even smallest shops!



The Versatile New Stewart-Warner Portable Balancer is priced to make it economical for even small shops to own their own balancing equipment. Its portability permits easy *in-place* balancing and vibration analysis of grinding wheels and machinery. Indicates angle and amount of unbalance . . . determines rpm and amount of vibration. Helps produce finer finishes and closer tolerances . . . prolongs life of wheels . . . permits longer runs between dressing. Also balances many other machine parts, such as drive motors, spindles, coolant pumps and adapters.

ENGINEERED FOR PRECISION BALANCING

. . . designed for ease of operation. (1) Stroboscope and meters mounted in same portable head for easy one-man operation. (2) Removable, lightweight electronic unit for easier balancing in confined spaces. (3) Electro-magnetic pickup can be simply placed on machine part, freeing operator's hands.

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Literature

1. Dry Abrasive Cutter. A well documented four-page folder, Bulletin DH-299, describes the Model A-2 Sever-All dry abrasive cutting machine. The 2-A Sever-All offers a fast, economical method of cutting solids, tubing, and structurals—cold-rolled steel, alloy steel and stainless steel—cast iron, and many non-ferrous metals. It will cut solids up to 4" square, standard pipe and tubing up to 6" diameter, angle iron up to 6" x 6", and channels up to 8". Complete specifications are listed and data on optional accessories included. Allison-Campbell Division, American Chain & Cable Company, Bridgeport, Connecticut.

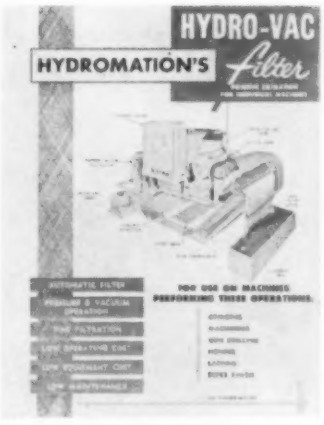
2. New Bearing Ball Bulletin. A new all-product bulletin, AP-1, describes and illustrates bearing balls, metal finishing materials, and decorative steel shapes of The Abbott Ball Company. The advantages of construction, performance, and adaptability are discussed in detail for each product. Representative applications, size and dimensional data, and a list of Abbott sales agents are included. Another important feature is tabular information on conversion of old Abbott standard ball nomenclature of the new, simplified AFBMA nomenclature. The Abbott Ball Co., Hartford, Conn.

3. Comprehensive Resume of Rubber-Bonded Abrasives. The latest and best information on Brightboy rubber-cushioned abrasives is contained in a catalog just off the press and available to all production men. Sixteen pages are devoted to methods and applications data, machine and manual operations, machine speeds and listings of abrasive textures and stock sizes. Included in the listings are revised stock sizes for 3" and 3½" wheels, as well as for four new wheel sizes: 6" x 1½" x ¾", 6" x 2" x ¾", 8" x 1½" x 1" and 8" x 2" x 1". Minimum center hole specifications conform to American Standards safety regulations. Brightboy Industrial Division, Weldon Roberts Co., Newark, New Jersey.

4. Coolant Filters. A recently-issued three-color, two-page bulletin gives detailed information on new Hydro-Vac filters. The Hydro-Vac filters automatically separate contaminants from coolants by applying both pressure and vacuum to the filtering media. They are designed in five sizes for individual machines performing such operations as grinding, honing, and lapping. Complete data is given on operation, application, and GPM capacity, plus schematic drawings and over-all sizes. Hydromation Filter Co., Detroit, Mich.

(See Number 1)

(See Number 3)



(See Number 4)

5. Comparators. New two-page, two-color bulletin describes the Mikron comparator in detail. Many outstanding features on the comparator are said not to be found on present-day comparators, except as optional equipment at extra cost. Mikron heads are interchangeable so that only one stand needs to be used. Mueller Gages Company, Pasadena, California.

6. Sandblasting Equipment. Four types of sandblasting equipment are described in this four-page, two-color bulletin. Each of the four is fully detailed, with drawings and data to illustrate its areas of best application. Complete specifications are given. Pressure Blast Manufacturing Co., Inc., Manchester, Connecticut.

(See Number 7)

7. Work Holding Devices. Twelve-page 1960 catalog, complete with prices, illustrates uses of the Lassy multi-purpose work holder, available in three models for production and toolroom use, as well as of a master angle plate available in two sizes and six models. Construction features of each unit are listed. Lassy Tool Co., Plainville, Connecticut.

To obtain literature use Reader Service cards on page 65. Circle on the card the number which appears at the start of the paragraph describing the literature you request.

FREE LITERATURE *continued*

8. Flexible Shaft Machines and Accessories. Thirty-four page brochure covers flexible shafting, flexible shaft machines, handpieces and accessories. This literature describes light and heavy duty machinery; floor, bench, overhead trolley, and portable wheel types. Suggested as of particular interest to foundries, shipyards, sheet metal shops, and other operations where flexible machining is required. Jarvis Corporation, Middletown, Conn.

9. Diamond-Cone Wheel Dresser. Flier in two colors gives complete description and specifications of the Crystal Lake Diamond-Cone wheel dresser for use on cylindrical, internal, and surface grinding machines. Three models are available. Model 1010 will dress up to a ½" radius or 90°-0°-90° angles on wheels up to 10" x 1", while the 1010R is similar in size, but for radius dressing only. Model 712 handles wheels up to 7" x ½", with up to ¼" radii and the same angles. Crystal Lake Engineering Company, Crystal Lake, Illinois.

10. Dust Control Equipment. "Freedom from Dust" is the title of a new twenty-eight page brochure describing the complete range of dust collection equipment made by Dracco Division, Fuller Co. Designated as Bulletin No. 805, the piece shows ways of using cloth filtration and cyclonic equipment for eliminating dust control and air pollution problems in industry. Illustrated application data shows how industry uses this equipment effectively to collect waste dust, or to return re-usable material for processing. Dracco Division of Fuller Company, Cleveland, Ohio.

11. New Tools Catalog. Forty-eight page catalog illustrates and describes 88 new Starrett tools, including new Satin Chrome steel tapes; master vernier height gages and calipers; many new micrometer calipers, inside micrometers, micrometer depth gages and micrometer heads; Satin Chrome combination sets, protractors, dividers and trammels; Dial-Master indicators and dial bore gages; and many others. The L. S. Starrett Company, Athol, Massachusetts.

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12. Tilting Barrel Finishing Machines. Three groups of machines are covered in this four-page flier on tilting barrel equipment, designated as Bulletin 101. Five different models are included in the direct motor (DM) series; three in the flask (FDM) series; and five in the Burr-Rite standard series. Within each group, the major difference is capacity. Complete specifications are listed, along with schematic drawings showing significant dimensions. Typical machines from each group are illustrated, along with optional equipment and accessories. Casalbi Company, Jackson, Michigan.

13. Portable Grinding Wheels. The safe use of grinding wheels is the subject of this 20-page brochure of the Grinding Wheel Institute. Such machines are among the most widely used in metalworking industries, are often operated by low-skilled employees with little experience. While, as the booklet points out, the wheels are strong, the severity of injury in case of breakage is likely to be high. Charts, tables, and photographs illustrate the safe ways to mount and operate portable grinding wheels. Grinding Wheel Institute, Cleveland, Ohio.

14. Industrial Grinding Service. Industrial grinding facilities are concisely detailed in a sixteen-page illustrated presentation offered by Universal Grinding Corporation, Cleveland, Ohio, to introduce its new 50,000 square foot plant. Typical of the company's 120 production grinders are 16 machines shown with the finished parts produced on each. Capacities and tolerance ranges of each grinder are described. Universal Grinding Corporation, Cleveland, Ohio.

15. Gear Deburring, Chamfering. A preliminary technical bulletin (No. DCG-1) covering new deburring and chamfering grinder for spur, helical and bevel gears is now available from Michigan Tool Co. The machine simultaneously deburrs and chamfers the entire contour of both ends of the teeth of gears. Michigan Tool Company, Detroit, Michigan.

16. Application Manual—Rubberized Abrasives. A new manual includes information concerning the many uses of rubberized abrasives, case histories on a variety of

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AND 1 PASS

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Here's truly high production, uniform, economical finishing of metal or plastic flat work such as sheets, bars, strips, stampings, and extrusions.

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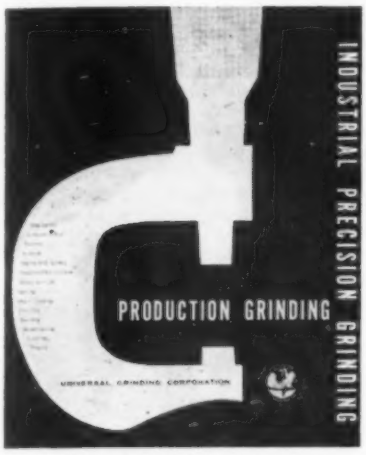
typical applications, and a copy of the latest Cratex catalog. The most efficient methods for mounting, dressing and truing, and recommended operating speeds are given in brief but complete form. Actual field operations in which a single operation with rubber-bonded abrasives has replaced a number of slower methods are described. Cratex Manufacturing Co., Inc., Burlingame, California.



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17. Precision Chuck. Two-page flier describes the PowerGrip precision chuck, points up its advantages, gives all specifications and prices. Advantages claimed for the unit are the ability to grip work either inside or outside, to hold long workpieces which project through the spindle, and to permit coolant to be fed through the draw tube for internal grinding. PowerGrip, Inc. Rockfall, Conn.

18. Precision Thread Comparators and Gages. A comprehensive and fully-illustrated catalog on the complete line of Johnson gages is said to contain considerable essential technical information, including recommended gaging procedures, some of which has never before been published. The Johnson Gage Company, Bloomfield, Connecticut.

19. Machine Cleaner and Degreaser. A new brochure entitled "Cimcool Machine Cleaner" (PC-355) describes the features of the product and suggests how it may be used. It also outlines how Cimcool machine cleaner may be used as a degreasing solution. In addition, it discusses the advantages of clean machines and points out the savings that can result. Cincinnati Milling Machine Co., Cincinnati, Ohio.

20. Industrial Power Tools. Sixty-four page catalog covers the complete Skil line of power tools and accessories for industrial applications. Included are such units as bench grinders, die grinders, portable grinders, and pneumatic grinders, together with accessories. Belt and disc sanders are also covered, as well as various appropriate types of grinding wheels, brushes, discs and related items. Skil Corporation, Chicago, Illinois.

21. Power Tools—"500" Line. Skil's 500 Line, manufactured for the hobbyist and home workshop, is fully outlined in a 24-page catalog for 1960. This is a different publication from the industrial catalog described above. In addition to the basic drill and saw units, the line includes a wide variety of accessory units which add to the versatility and usefulness of the basic machines. Skil Corporation, Chicago, Illinois.

22. Surface, Cylindrical Grinders: A two-page flier punched for standard three-ring notebook doubles as an announcement for the new Model S612 surface grinder from K. O. Lee Company. The sheet details the features of the new machine, lists specifications. On the reverse side are similar data for Model BA960 universal grinder. K. O. Lee Company, Aberdeen, South Dakota.

23. Precision Spindles: New pocket-sized 36-page bulletin S-18 pictures and describes over 60 different types of precision spindles for grinding and similar operations, including the newest models for electrically-aided grinding. Many of the spindles covered in this bulletin have not been previously presented. Pope precision interchangeable extension arbors and wheel holders, and Pope spindle rebuilding and repair service facilities are also described. Pope Machinery Corporation, Haverhill, Massachusetts.

24. Grits and Grinds. Volume 51, Number 1 of Norton's long-lived publication features two articles about mounted wheels. One is concerned with a new wall chart showing safe operating speeds; the other is concerned with their use in tool and

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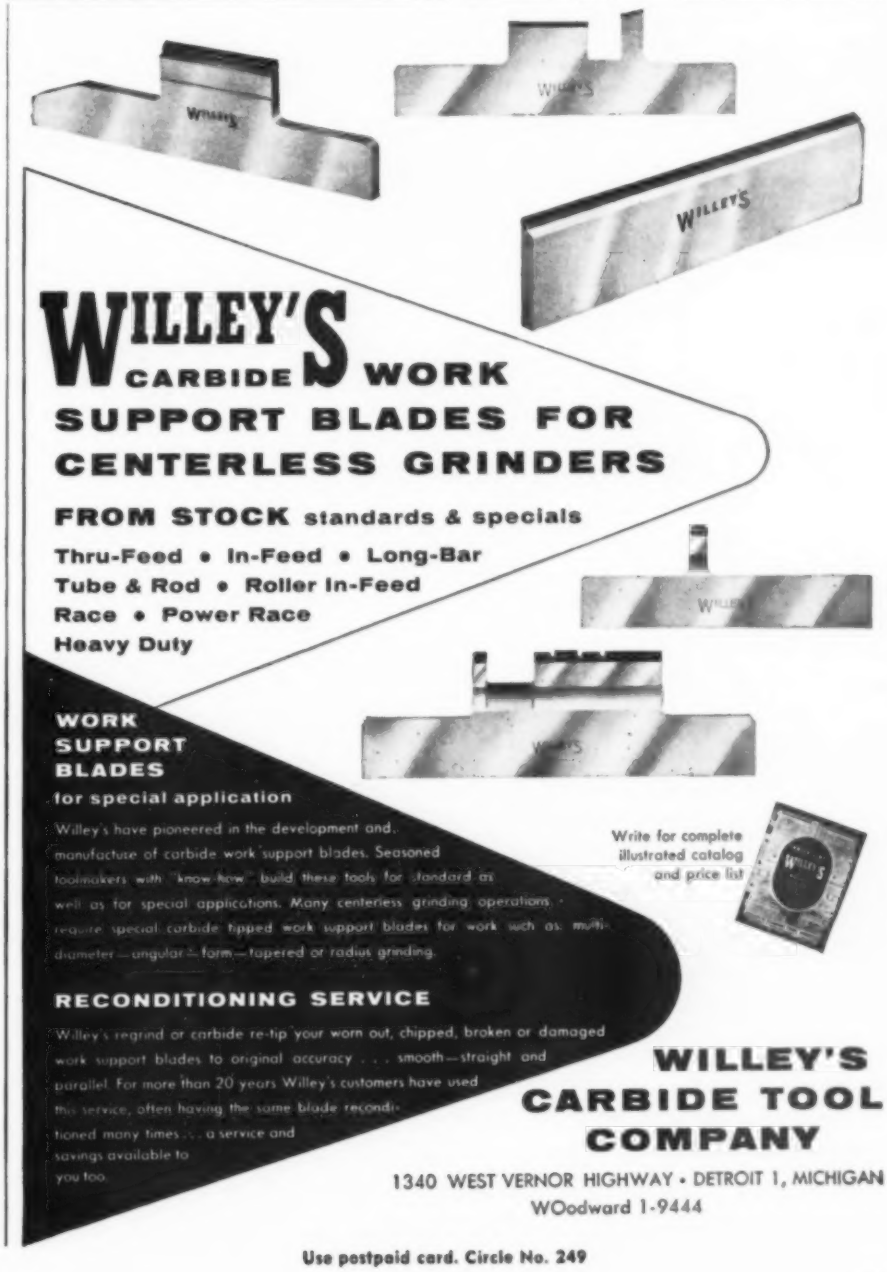
cutter grinding. A third discusses grinding fluids, while a back-cover safety message completes the issue. Norton Company, Worcester, Mass.

25. High Speed Hand Grinder. A new Dumore Series 40 hand grinder develops a no-load speed of 35,000 rpm, is 10" long,


WILLEY'S
CARBIDE WORK
SUPPORT BLADES FOR
CENTERLESS GRINDERS
FROM STOCK standards & specials
Thru-Feed • In-Feed • Long-Bar
Tube & Rod • Roller In-Feed
Race • Power Race
Heavy Duty
WORK
SUPPORT
BLADES
for special application
Willey's have pioneered in the development and manufacture of carbide work support blades. Seasoned toolmakers with "know-how" build these tools for standard as well as for special applications. Many centerless grinding operations require special carbide tipped work support blades for work such as: multi-diameter—angular—form—tapered or radius grinding.
Write for complete illustrated catalog and price list
RECONDITIONING SERVICE
Willey's regrind or carbide re-tip your worn out, chipped, broken or damaged work support blades to original accuracy . . . smooth—straight and parallel. For more than 20 years Willey's customers have used this service, often having the same blade reconditioned many times . . . a service and savings available to you too.
WILLEY'S
CARBIDE TOOL
COMPANY
1340 WEST VERNOR HIGHWAY • DETROIT 1, MICHIGAN
WOodward 1-9444

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FREE LITERATURE continued

weighs 3¾ lbs. These and other pertinent data about the unit are detailed in a new two-page flier (Form No. S40-60A). A bracket accessory and its use are illustrated, while a cut-away drawing of the machine highlights its advantages. The Dumore Company, Racine, Wisconsin.

26. Dust Collectors. This 16-page bulletin provides considerable basic information on suitable locations for dust collectors, as well as general application data, in addition to specifications, illustrations, and general discussion of eight sizes of Hammond DusKolectors. It also includes illustrations and data on optional equipment and installation accessories. Hammond Machinery Builders, Kalamazoo, Michigan.

27. Air Marking Tool. Cardboard folder announces the availability of an air-operated marking device said to be effective on metals, glass, ceramics, plastics. It is described as being a true reciprocating air motor with a replaceable carbide stylus. The whole unit is about the size of a fountain pen, weighs about 5¼ ounces. The Rotor Tool Company, Cleveland, Ohio.

28. Centerless Belt Grinders. Four-page folder in color (Bulletin 20) describes three models of centerless grinding machines using abrasive belts for both

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grinding and regulating. Type 914 is a heavy-duty machine for severe stock removal; Type 614 is a general-purpose machine for application where heavy stock removal is not a primary requirement; Type 486 is a smaller model, for precision grinding and finishing of small parts by plunge cut or thru-feed methods. Specifications for the three machines are included. Production Machine Company, Greenfield, Massachusetts.

29. Centerless Finishing and Polishing Machines. Another folder, Bulletin 20, describes the Four Eighty Four series of centerless belt machines for finishing and polishing. These machines are available in both single and duplex models, for either wet or dry operation. Pictures, sketches and specifications are included. Production Machine Company, Greenfield, Massachusetts.

100. Sam Safety Posters. Single copies o the seven "Sam Safety" cartoons whic have appeared in the last seven issues o GRINDING and FINISHING are availabl on request as long as the supply last Also available in quantities. Use th Reader's Service Card to request price

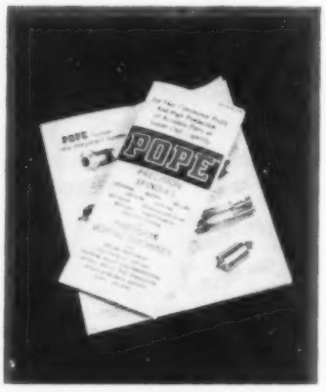
CURRENT FILMS

"OLD AS THE HILLS"

As a part of the celebration of its 75t anniversary, Norton Company has jus released a new motion picture designe for showings to a variety of genera audiences throughout the country.

"Old as the Hills" tells the story o abrasion, from the first crude natura stones for sharpening tools and polishin armor to today's variety of abrasives fo almost every manufactured product.

For information on free bookings o this 16mm sound film in color, write Norton Company, Worcester 6, Mass.



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Now! see the NEW!
K. O. LEE GRINDERS
. . . the World's Most Versatile Grinding Machines!

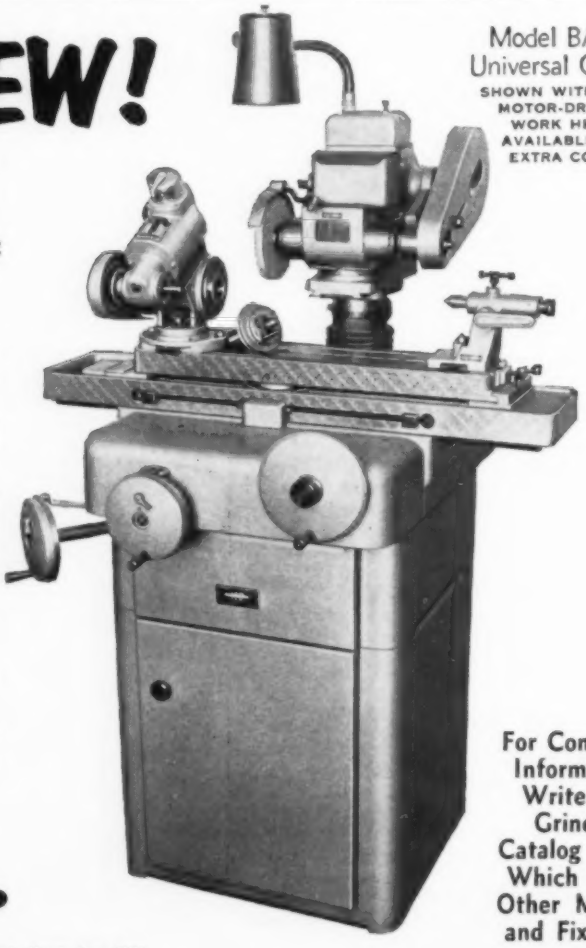
The Model BA960 Universal Grinder is a result of over 30 years of experience in the manufacture of precision grinding machines, attachments and fine tools.

This machine is the biggest value in the industrial market. A truly universal machine, spindle speeds from 3450 to 20,700 RPM with standard equipment included, capable of handling all types of O.D., I.D. grinding operations demanded by the average shop.

K. O. Lee grinders have proven themselves year after year in the metal working industry. They have outsold all other grinding machines in their field.

We invite you to visit our Distributors. Compare this machine for quality, engineering, workmanship, sturdy construction and modern appearance against any machine on the market. See for yourself how much more you get for how much less you pay.

We believe that you will be pleasantly surprised.



Model BA960 Universal Grinder
SHOWN WITH B943 MOTOR-DRIVEN WORK HEAD AVAILABLE AT EXTRA COST

For Complete Information Write for Grinder Catalog TG-1 Which Lists Other Models and Fixtures

K. O. Lee Co.
ABERDEEN, SOUTH DAKOTA

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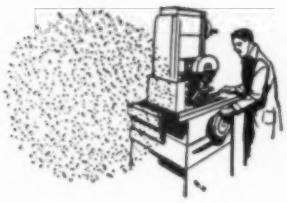


Equipment and Materials

Tracer-Controlled Surface Grinder

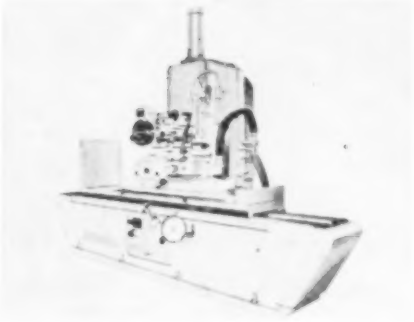
A new tracer-controlled, hydraulic feed surface grinder, designed for automatic reproduction or transverse forms on large pieces, has recently been introduced.

The tracer controlled grinder is equipped with an automatic cross feed and an automatic down feed. The automatic cross feed, moving the wheel across the work, can be preset for the width of the contour to be ground, automatically reversing and initiating a down feed at the preset limits. The increment of cross feed for each table stroke can be preset to feed from .0002" to .040" and is automatically initiated by the table reversal.

On contours or forms that are too deep to be feasible to reproduce in a single pass, the automatic down feed can be used in conjunction with the automatic cross feed. The automatic down feed can be preset to feed from .0025" to .060" at each cross feed reversal. Therefore, only the preset amount of material is removed each time the wheel traverses the width of the part being ground. The preset feed is automatically initiated each time the cross feed reaches its preset limit and reverses.

A precision down limit device determines the total amount of stroke removed. The total amount of feed before kick-out is adjustable and can be readily set using gage blocks totaling 1.000" plus the desired total amount of feed. When the down limit is reached, the down feed is automatically disengaged.

Provision is made for mounting the contour template off the column of



the machine. The template mounting bracket is adjustable vertically so that automatic contour grinding can be performed on any thickness of work within the limits of the maximum clearance of the grinding wheel over the work table.

These features make it economically feasible to form grind large parts, particularly of some of the new, harder and difficult-to-grind materials.

Gallmeyer & Livingston Co., Grand Rapids, Michigan.

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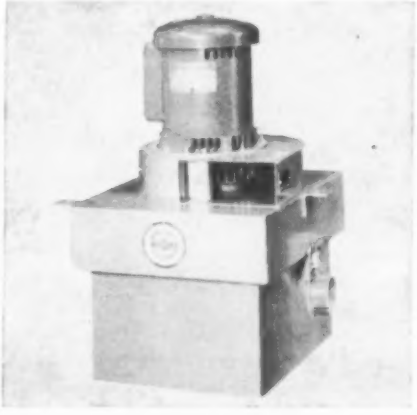
Small, Low-Cost Dust Collector

A compact, low cost industrial dust collector for use in any light dust-



producing operation is now in production at Torit Manufacturing Company.

The new model, designated 301, is only 21½" high and occupies a space 12" x 14". It can be conveniently located on or under work benches.

It is reported to be particularly suited for dust control in electronic and other precision production as well as for other light or occasional dust-producing manufacturing operations.

Model 301 uses a fire-resistant throw-away glass filter. It is equipped with a 1/3 hp motor.

Performance ratings under standard test conditions are: 200 cfm; velocity—4100; static pressure—1.7" wg; inlet—3". Price is $138 fob St. Paul.

Torit Manufacturing Company, St. Paul, Minnesota.

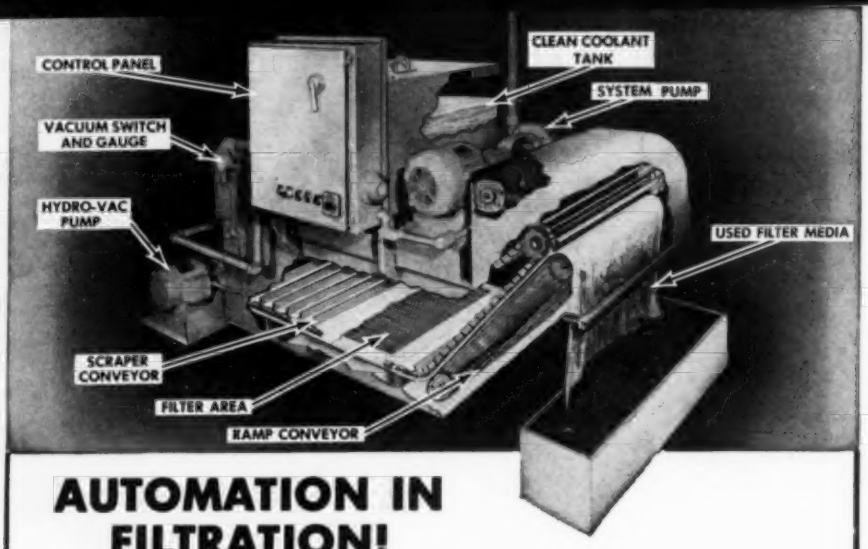
Use postpaid card. Circle No. 85

High-Speed Hand Grinder

A totally new, high-speed hand grinder, the Series 40, has just been added to the Dumore line of portable precision metalworking tools.

A higher, full-load working speed than that offered in comparable grinders is made possible by "balanced power", a motor design feature that reduces no-load speed for longer bearing life and increases full-load speed for maximum production and faster metal removal with carbide burrs or mounted wheels, according to The Dumore Company.

Other advantages claimed for the Series 40 are longer life and greater dependability because of sealed-for-life bearing lubrication; exclusive metal seals to protect bearings from dirt and



AUTOMATION IN FILTRATION!

- Completely automatic operation
- Used with individual machines
- Compact — with low liquid inlet
- Low operating cost
- Fine degree of filtration
- Pressure and vacuum forces act on filter media
- Any coolant — any sludge

HYDROMATION FILTER CO.

19661 Schoolcraft Detroit 23, Michigan VErmont 8-0492

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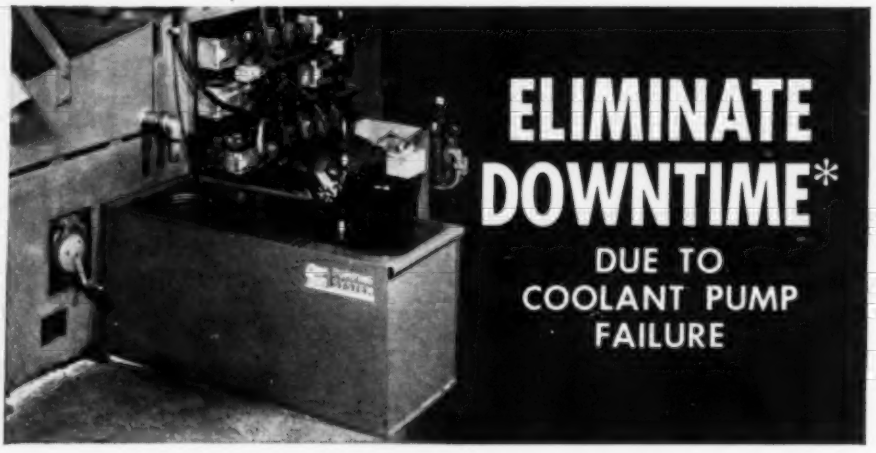


ELIMINATE DOWNTIME* DUE TO COOLANT PUMP FAILURE

GRAYMILLS
SUPERFLO COOLANT
PUMPING SYSTEMS

*Installed in a matter of minutes, GRAYMILLS Coolant Pump and Tank Units eliminate production downtime by being ready to go when built-in units fail. GRAYMILLS Pumping Systems are easy to clean, can be used with liquids bearing abrasives and will handle any type coolant or cutting oil. Available with centrifugal or gear type pumps, 1/25 to 1/2 HP, in tank capacities of 2 to 128 gals.

Every plant needs one or more reserve GRAYMILLS Pumping Units as insurance against production downtime. Get yours today! They're sold by leading Industrial Distributors everywhere.

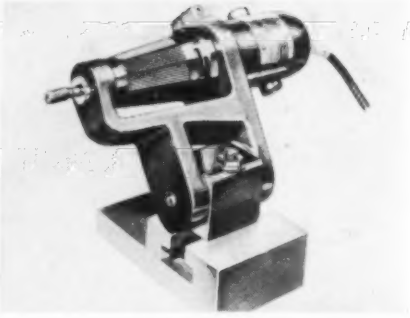
Write for Complete Catalog No. 56R

GRAY-MILLS **GRAYMILLS CORPORATION**
3727 N. LINCOLN AVE. • CHICAGO 13, ILLINOIS

DESIGNED AND PRICED FOR MACHINE BUILDERS USE

Use postpaid card. Circle No. 252

NEW EQUIPMENT *continued*



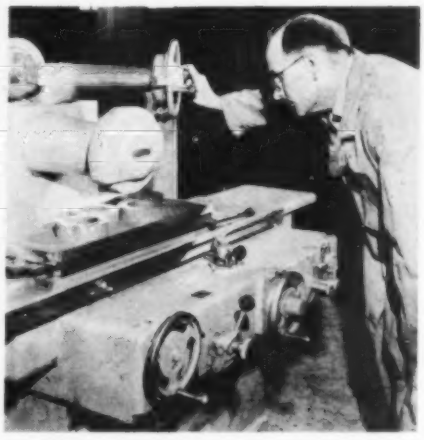
abrasives; and "king-sized" brushes for longer brush life.

The Dumore Company, Racine, Wisconsin.

Use postpaid card. Circle No. 86

New 8 x 24" Surface Grinder

Norton Company announces that its Type S-3 surface grinder is now available in the 8 x 24" size. Like the 6" model announced in late 1958, the new 8" surface grinder's most significant features are ease of operation and a substantial increase in table speed which reduces grinding time as much as 50% over similar sized machines. Maximum table traverse speed is 125 feet per minute.



In addition to reducing grinding time, the high maximum table traverse speed helps to reduce burn, checking and cracking of the work. This advantage is particularly significant when grinding heat sensitive steels.

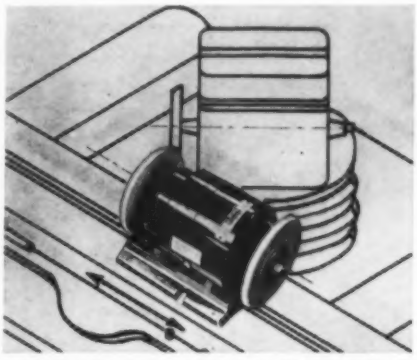
Another significant feature is the machine's capacity for grinding a workpiece as high as 13¾" under a standard 10" diameter grinding wheel.

Norton Company, Worcester, Mass.

Use postpaid card. Circle No. 87

Motorized Diamond Wheel Dresser

Important cost savings for users of diamond wheels are predicted with the use of Niagara Cutter motorized diamond wheel dressers. Its "kiss" touch and control are said to assure close accuracy and minimum waste of diamond stock.



The dresser is a self-contained, double end, 115 volt, 60 cycle, 1 amp. constant speed, fan cooled motor equipped with two dressing wheels. The wheels operate at 3450 rpm.

Net weight is 9 lbs. Price fob North Tonawanda, New York, is $39.50.

Niagara Cutter Division, Bollier-Damerell, Inc., North Tonawanda, N.Y.

Use postpaid card. Circle No. 88

New Bonded Abrasive Shapes for Tumbling

Bonded shapes for abrasive tumbling manufactured by Norton Company now include round and triangular pins, especially designed for barrel finishing intricate parts. The abrasive pins were developed to finish hard-to-reach areas of serrated or grooved machined pieces which have proved difficult to finish completely with the previously available tumbling abrasive, molded triangles or spheres.

The new shapes are designated TUMBLEX RP (round pin) and TUMBLEX TP (triangular pin) abrasive. The round pins are presently available in standard $\frac{5}{8}$" length and in diameters

metalloid WOS

(Water—Oil—Soluble)

WOS is miscible in either oil or water. It provides a range of oil and water fluids with a minimum concentrate inventory. Dilutions depend upon the severity of the operation.

Grinding or machining of present day metals is no problem with WOS.

CONTAINS NO SULFUR

NON-TOXIC • NON-CORROSIVE

Metalloid manufactures premium cutting fluids for all types of metal machining and grinding.

EASTERN DISTRIBUTOR OF *New* **KOOLMIST** *the world's finest* **MIST** Coolant System
Mfg. by Lloyd Tool Corp., Pasadena, Calif.

METALLOID CORP.

HUNTINGTON, INDIANA

Use postpaid card. Circle No. 254

metalloid Electrogrind

A new water-conductive fluid for all types of electrolytic grinding and machining.

NON-TOXIC

NON-CORROSIVE

Will not rust or attack any type metal known. Machine, tools, and work will be free of salt deposits commonly encountered. Liquid form—no mixing problems.

Metalloid manufactures premium cutting fluids for all types of metal machining and grinding.

EASTERN DISTRIBUTOR OF *New* **KOOLMIST** *the world's finest* **MIST** Coolant System
Mfg. by Lloyd Tool Corp., Pasadena, Calif.

METALLOID CORP.

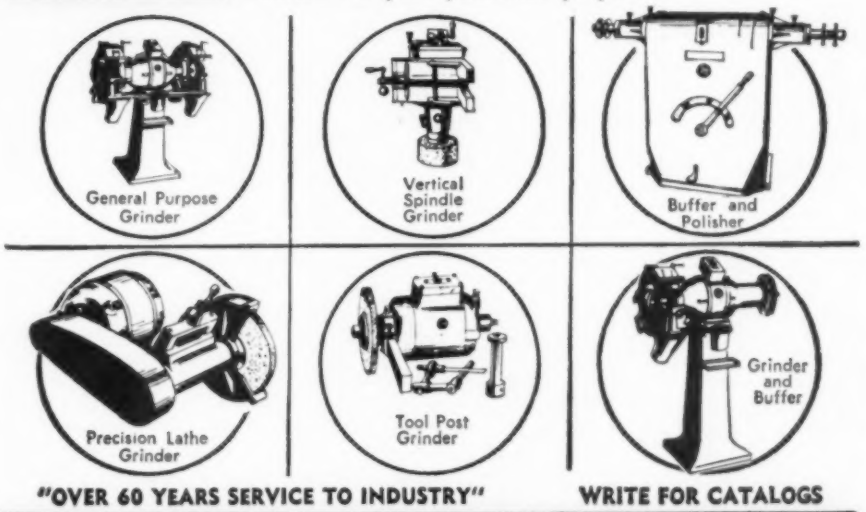
HUNTINGTON, INDIANA

Use postpaid card. Circle No. 255

The Answer... TO INDUSTRY'S DEMAND FOR QUALITY, EFFICIENCY AND LOW COST ECONOMY

UNITED STATES ELECTRICAL GRINDERS-BUFFERS

An investment in better, faster, production through the use of tools expertly designed and conscientiously crafted for your particular purpose.



"OVER 60 YEARS SERVICE TO INDUSTRY" WRITE FOR CATALOGS

The United States Electrical Tool Co.

3640 LLEWELLYN ST., CINCINNATI 23, OHIO

Use postpaid card. Circle No. 253

of 3/16" and 3/8". The triangular pins are an inch long and 3/8" on the sides.

All TUMBLEX abrasive shapes are designed for the mass processing of ferrous and non-ferrous metals, plastic, and rubber parts to remove burrs, heat treat scale, refine surfaces and form radii. This method replaces many hand deburring and polishing operations resulting in lower finishing costs.

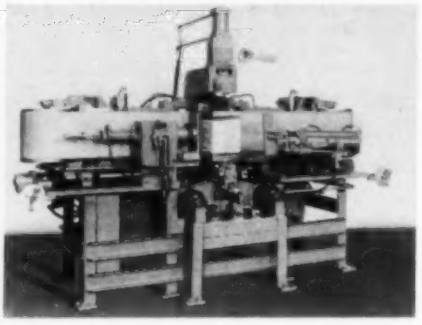
Norton Company, Worcester, Mass.

Use postpaid card. Circle No. 89

Automatic Precision Edge Grinder

Murray-Way Corporation has added to their line a unique new machine known as a "precision edge grinder," said to be particularly suitable for close-tolerance sizing of products requiring a great deal of stock removal.

Corners of finished products are perfectly sharp. Edges are ground parallel and square. Work pieces pass between two oscillating abrasive belts, index, and then return. The machine may be



adjusted to allow work to make several passes before indexing, or they may be arranged in tandem, with indexing to suit the operation. Loading may be manual or automatic.

Murray-Way Corporation, Birmingham, Michigan.

Use postpaid card. Circle No. 90

Cut-Off Wheels

A new line of cut-off wheels designed for safe, economical operation in all kinds of high-production cutting has recently been introduced.

The complete line of Dayton Safety wheels includes resinoid, resin-rubber and rubber, reinforced and non-reinforced straight cut-off wheels in thicknesses from 1/32" to 1/4". Resinoid, resin-rubber and all reinforced wheels are available in diameters up to 20". Rubber wheels are available up to 26" in diameter. The wheels are manufactured of Aluminum Oxide and Silicon Carbide abrasives in various combinations and grain sizes according to application.

Dayton Safety Cut-Off Wheels are available for all makes and models of cut-off machines, and for both wet and dry cutting operations. Every wheel is produced to close limits of balance, dimension and straightness,

to assure accurate, safe, and reliable performance. There are few materials available that cannot be satisfactorily cut with these precision wheels.

Simonds Worden White Company, Dayton, Ohio.

Use postpaid card. Circle No. 91

ACCURACY .0002 T.I.R.

.0002 T.I.R. or less at Spindle Nose, .0005 T.I.R. or less on Test Arbor six inches from Spindle Nose

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

Clip ad to your letterhead and send for Literature

K. O. Lee Company, Aberdeen, S. D.

Use postpaid card. Circle No. 256

suspension type FLEXIBLE SHAFT MACHINE eliminates tooling problem for I.B.M.

International Business Machines Corporation had the problem of reaming holes .813" in diameter in the mounting hanger on the main base of their 407 Accounting Machine. To eliminate expensive tooling for this operation, they selected a STOW V50 portable flexible shaft machine, specially fitted with an on-off switch mounted on the handpiece.

The V50 machine delivers 1150, 2100, 3450, or 5750 RPM, is furnished with a 6 foot flexible shaft. Other speeds can be achieved by using different size pulleys (I.B.M. ran the reamer at 750 RPM.)

Available in either 3/4, 1, 1 1/2 or 3 HP, the V50 can be used for grinding, buffing, sanding, wire brushing and drilling.

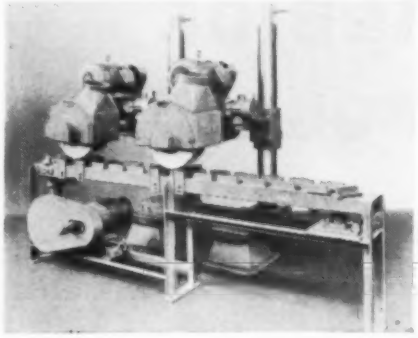
STOW MANUFACTURING CO.

310 Shear Street Binghamton, New York

Use postpaid card. Circle No. 257

Straight-Line Polishing and Buffing Machine

A new low-cost Acme straight-line polishing and buffing machine for high-production light-duty operations has recently been announced. The machine is said to be ideally adapted for the finishing of such parts as nameplates, door handles, hinges, small moldings, and similar products.



Adjustable lathes may be positioned around the machine for tangent or wide-wheel cross-cut buffing operations. Acme polishing heads and abrasive-belt arm attachments can be added for strapping and contact-wheel operations for deburring and blending.

Acme Manufacturing Co., Detroit, Michigan.

Use postpaid card. Circle No. 92

Why WAUCONDA TOOL & ENGINEERING COMPANY, INC. Algonquin, Illinois ENTHUSIASTICALLY REPORT ON THIS Globe MACHINE?

There Are Many Reasons:

1. Delicate, precision parts are now tumbled which couldn't be previously.
2. Bottlenecks eliminated—four barrels (only two shown) give versatility of operation.
3. Time cycles reduced because of improved barrel agitation.
4. One man operation.

The Wauconda Tool & Engineering Co., Inc., a national supplier of intricate, close tolerance, precision missile and electronic parts, have found from experience the superiority of Globe Barrel Finishing Equipment.

GENTLE, ACCURATE ACTION

LOWER DEBURRING COSTS

CONTINUOUS PERFORMANCE

Four barrels permit different parts to be processed simultaneously. One barrel can be removed while the others are running. Number of parts put through the department increased.

SEND SAMPLE PARTS AND SPECS. FOR ANALYSIS.

Globe BARREL FINISHING EQUIPMENT

Manufactured by CASALBI COMPANY

P. O. Box 411, Jackson, Michigan

Write for name of local representative and catalog

Use postpaid card. Circle No. 259

THE BULLARD SAFETY "PUP CUP"* WHEEL

The only break-proof reinforced cup wheel available with proven design and performance. Quadruple fibre glass reinforcement internally. 5/8–11" nut bonded externally which commands longer life, more usable abrasive . . . and it costs less than conventional cup wheels! For fast, safe snagging for all applications, specify the "PUP CUP". Size 6 / 5½ x 1¼ – 1½" rim. ⅝ – 11 thread only. Please write for literature.

*Patent Pending

Manufactured only by BULLARD

GEO. H. BULLARD CO., INC.

WESTBORO, MASS / DISTRIBUTORS IN PRINCIPAL CITIES

Use postpaid card. Circle No. 258

MISTKOP STOPS MIST

COLLECTS MIST-FOG EFFECTIVELY IN A SMALLER SPACE

NON-ELECTRONIC!

This efficient Mistkop unit provides low-cost mist control for all machining operations employing coolants or lubricants. Requires no duct work or costly piping—*is actually portable!*

Mistkop is sturdy in design—has a minimum number of parts and gives long, trouble-free service. Stops clouding of lights . . . eliminates fire hazards of uncontrolled mist. Write for detailed description.

AGET Manufacturing Company

1380 Church Street • Adrian, Michigan

Use postpaid card. Circle No. 260

HOFFMAN DIAMOND BITS

...for faster low cost drilling or grinding in hardest materials

Swivel, Adaptor and Barrel shown with Impregnated Bit

Impregnated or Surface Set

DRILL HARDEST MATERIALS KNOWN for accurate, high-speed production of glass, marble, ceramics, tungsten carbide and similar products. Hoffman Bits produce efficient coring and finish grinding results at operational speeds to meet requirements of most advanced production equipment.

LONG, EFFICIENT OPERATION grinding and finishing items with face widths as low as .015" . . . O. D. gauge remains constant for life of bit. Hoffman Narrow Kerf Bits are outlasting ordinary bits at better than a 4 to 1 ratio on many manufacturing operations . . . are eliminating heavy reject losses.

EASILY OPERATED ON EXISTING EQUIPMENT with no complicated change-over needed. Even ordinary hand drill rig is quickly converted to high-speed Diamond Drill Press with addition of Hoffman Air or Water Swivel and Narrow Kerf Bit. Diamond Impregnated or Diamond Surface Set Bits are recommended according to material to be drilled. Material samples are tested FREE in Hoffman Laboratories.

Write for Additional Information Now. Send in Sample of Material You Are Coring for FREE Testing.

DIAMOND DRILLING SPECIALISTS SINCE 1902

HOFFMAN BROS. DRILLING CO.

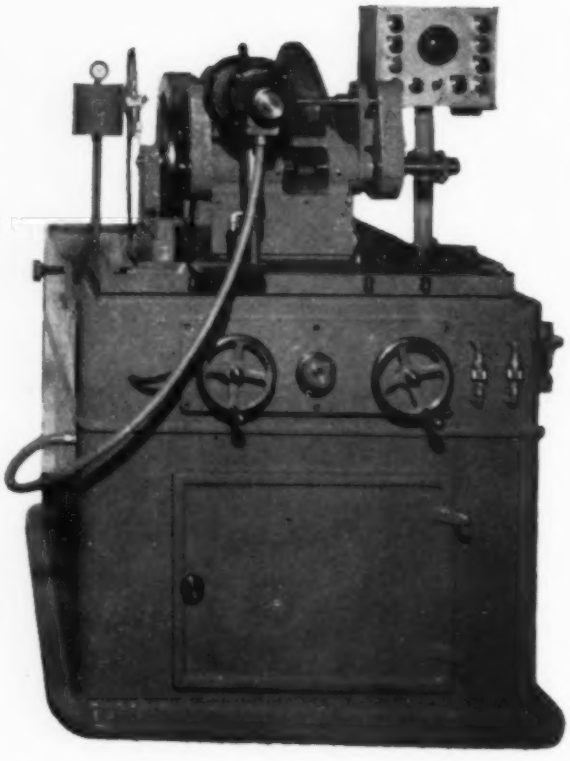
102 Cedar Street • Punxsutawney, Pa.

Use postpaid card. Circle No. 261

NEW!

CARBIDE DISPOSABLE TOOL GRINDER

(Automatic)



GRINDS ANY SHAPE OR RADIUS.

Holds sides and radius perfect tangent. Will hold .0005 tolerance. Will grind negative or positive angle tools. *One operator can easily operate two machines.* Will regrind your used blanks at a small fraction of their original cost.

Write for further information.

HARVILL-JOHNSON CORP.

618 East Ten-Mile Road
Hazel Park, Mich. Ph. Jordan 4-6110

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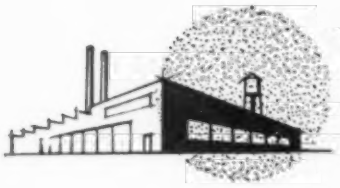


News from the Industry

Sheffield Holds One-Day Grinding Seminar

Seventy representatives of more than thirty-five companies in the United States and Canada attended a special one-day seminar in grinding at The Sheffield Corporation, Dayton, Ohio, on March 9.

The object of the seminar was to present new and more productive techniques in precision grinding of threads, forms and gears with the Crushtrue® process as well as with ultrasonic energy. Clinic participants also previewed machines and gages the company will demonstrate at the 1960 Machine Tool Exposition in Chicago.

The meeting was headed by Edgar Hakanson, assistant vice president and manager of the Machine Tool Division. Also participating in the presentation of the technical sessions was Walter Burkhart, assistant division manager.

Epoxy Resins Speed Prototype Production

When the "car of tomorrow" had to be shown "today" modern materials and methods made it possible.

The car of tomorrow is the Levacar Mach I by Ford Motor Co. "Today" was three weeks and four days after Wettlaufer Engineering Corp. of Detroit started the job of producing a working prototype from a clay model provided by Ford stylists.

Using virtually every method of tooling known in the automotive field, Wettlaufer provided the prototype with mostly aluminum for the outside surfaces and mostly epoxy resin plastic formulations for the inside surfaces.

Ford Motor Company's Levacar Mach I, the first full-scale, wheelless vehicle utilizing air propulsion, is given a trial run at the Rotunda, Dearborn, Michigan, by Dr. Andrew A. Kucher, vice president for engineering and research, who first proposed the idea over 30 years ago. Styling of the car was by Ford's styling office, directed by vice president George W. Walker (standing).

The headrest, back seat, armrests, floorpan, and curved front portion in the dashboard area are a one-piece lamination of glass cloth and epoxy resin. This is said to be the greatest single saving from the use of epoxies.

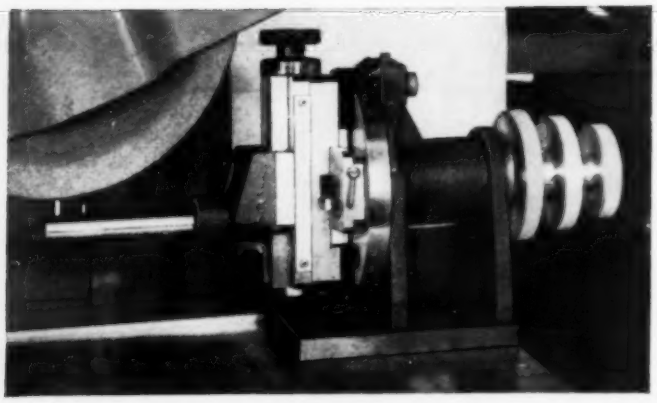
New Firm To Handle Boron Carbide Products

Formation of a new company, Boride Products, Inc., to handle U.S. distribution of gages and other industrial tools made of boron carbide produced by a patented new French process has been announced by James W. Frederick and Charles G. Henning of Detroit. Offices and plant are at 830 East Drayton Avenue, Ferndale, Mich.

Both principals in the new company have had long experience in industrial abrasives, Frederick with the Bay State Abrasive Co., and Henning with the Carborundum Company, and both are widely acquainted in the Michigan tool and gage field.

W. A. Johnson Heads R-O Manufacturing

William A. Johnson has been elected president, and Elwood Hemlin, vice president of R-O Manufacturing Co., 31171 Stephenson Highway, Madison Heights, Michigan. The firm has a contract for exclusive manufacturing and sales rights for R-O universal form relieving fixtures, grinders and attachments. A new plant of 10,000 square feet has been built on Stephenson Highway for production of the equipment used in form relief sharpening of



NOW . . . DRESS ANY WHEEL FORM

in half the time with the direct reading

TANGI-MATIC DRESSER

- completely self-contained
- dresses any combination of tangents and/or radii
- no special skill required to do precision dressing
- greater accuracy thru bottom dressing method

See your Threadwell Distributor or write for free bulletin T-244

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THREADWELL TAP & DIE CO.
Greenfield, Mass.

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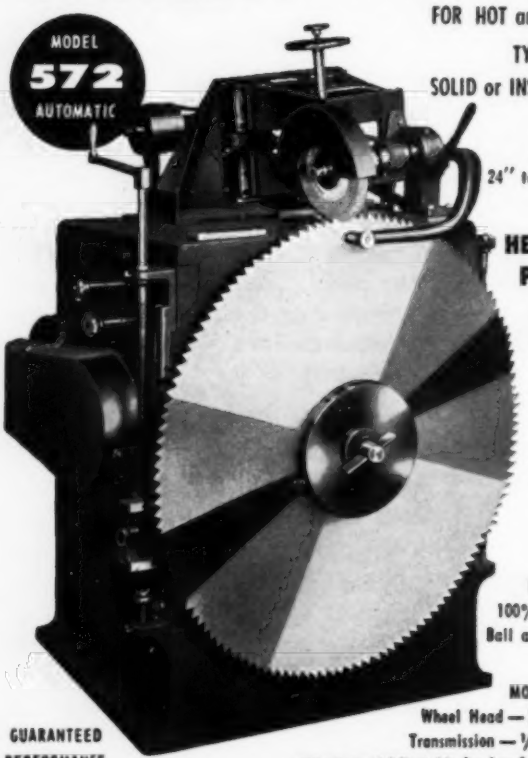
HANCHETT METAL SAW SHARPENER

FOR HOT and COLD SAWS
TYPES
SOLID or INSERTED TOOTH

MODEL 572 AUTOMATIC



CAPACITY
24" to 72" and Larger

HEAVY DUTY
POWERFULL
SMOOTH
ACCURATE

DEALER INQUIRIES INVITED

BEARINGS
100% Anti-Friction
Ball and Roller Types

MOTORS
Wheel Head — 2 H.P. — 1800
Transmission — ½ H.P. — 1200
Wheel Head Adjustable for Any Saw Tooth Angle

GUARANTEED PERFORMANCE

HANCHETT MANUFACTURING COMPANY
Main Plant
BIG RAPIDS, MICH.
West Coast
PORTLAND 1, ORE.

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W. A. Johnson

cutting tools and other tool room grinding operations in the metalworking industry.

Changing Faces

Election of **Louis F. Weyand** as vice chairman of the executive committee was announced recently by Minnesota Mining & Manufacturing Co.

The St. Paul firm also announced the election of **J. F. Whitcomb** as divisional vice president in charge of the coated abrasive and related products division.

M. E. Yancey

Morris E. Yancey, Charlotte, N. C., has joined Morse Twist Drill and Machine Co., New Bedford, Mass., as sales representative for North and South Carolina. Morse is a division of Van Norman Industries, Inc.

J. Brandon Shaw has been promoted to eastern sales manager and **David S. Hodgson** to distributor sales manager of The Producto Machine Company,

J. Brandon Shaw

FISKE'S MAGIC COMPOUND

This Water Soluble Cutting Compound Stays Mixed

FISKE'S "MAGIC" COMPOUND, when dissolved in water, goes into a permanent emulsion—will never separate. It cools, lubricates and produces a high finish. Lengthens tool life. Does not become rancid. Try FISKE "MAGIC" COMPOUND and see the improvement in your work.

Bulletins describing FISKE'S MAGIC COMPOUND and other specialty lubricants and coolants sent on request.

FISKE BROTHERS REFINING CO. 90th Anniversary NEWARK, N.J.-TOLEDO, O.

FISKE'S
Since 1870

METAL WORKING LUBRICANTS

FISKE BROTHERS REFINING CO.
129E Lockwood St., Newark 5, N. J.
Plants: Newark 5, N. J. and Toledo 5, Ohio

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Bridgeport, Connecticut. Both have their headquarters in the main offices.

David D. Walker has become assistant chief engineer of the Erickson Tool Company, Solon, Ohio.

D. S. Hodgson

D. D. Walker

Promotion of **George E. Gunderson** to vice president in charge of production for Brad Foote Gear Works, Inc., Chicago, Ill., a new position, was recently announced.

Appointment of **Saul Silverman** to its metal working service staff is announced by E. F. Houghton & Co., Philadelphia.

Kaydon Engineering Corp. Changes

Two new positions of executive vice president and other organizational changes have been announced for The Kaydon Engineering Corp. by **Frank J. Donovan,** president.

The vice presidents are **Frank X. Bujold** and **J. Frank Oehlhoffen.**

Mr. Bujold, general manager of the Frauenthal Division, assumes additional responsibilities for manufacturing, purchasing and engineering at Kaydon.

Mr. Oehlhoffen, who has been vice president and sales manager at Kaydon, will be in charge of product development for both automotive and commercial items.

David C. Maxwell becomes general sales manager, with **Robert A. Weisse** as his assistant and **Robert L. Blais** as sales administration manager.

Thor Power Tool Shifts New York Office

Thor Power Tool Company, Aurora, Illinois, has moved its New York customer service branch and sales office to a new building at 58-10 Broadway, Woodside, Long Island.

The recently-completed building, nearly twice as large as Thor's former location in Long Island City, is headquarters for domestic sales in eastern New York, Connecticut and Vermont.

Export sales will continue to be handled from 250 West 57th Street, New York City, N.Y.

Other announcements made known the promotion of **Robert J. Grace** to be

TESTS *with* CLOVER LAPPING COMPOUND

Machine lapping is always important —no one uses the process unless it is. And, as makers of the first commercial abrasive compound, Clover knows that the kind of lapping compound you use can make a vast difference in efficiency as well as in finish.

Only testing can prove out the best combination of lap speed, grain, vehicle and pressure. But one thing is sure: you might as well have Clover's 50 years of tests behind you when you start your own.

Check with Clover on lapping and grinding problems. The hardest lapping jobs often respond to an answer that was worked out for something entirely different. Use Clover's experience for a starter — *write for suggestions and samples.*

Clover Manufacturing Company

Norwalk, Connecticut

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Since 1903

We also make **CLOVER COATED ABRASIVES**

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THE PRACTICAL, DEPENDABLE, QUALITY, VAPOR COOLANT SYSTEM!

For Continuous High Production and Longer Tool Life

Here is the compact, popular Coolie Toolie Vapor Generator that in just a few short years has made flood cooling old-fashioned. By a unique application of evaporative cooling and heat of vaporization, the Coolie Toolie unites the combined heat absorption properties of compressed air at the precise moment of expansion, with water and coolant concentrate at the point of vaporization, to provide the most efficient method yet known to remove heat from cutting and grinding surfaces.

There's no reason to spend thousands of dollars on new equipment when, with a Coolie Toolie Vapor Generator, you can make your present equipment more efficient by increasing speeds and feeds. FOR INCREASED TOOL LIFE — INCREASED PRODUCTION—EASY INSTALLATION AND OPERATION —AND LOW COST.

ORDER YOUR COOLIE TOOLIE VAPOR GENERATOR TODAY

$49.40

Includes 1 can Coolie Coolant Concentrate (makes 1 gal. coolant)

Try the Coolie Toolie Vapor Generator for 10 days. If you're not completely satisfied, we'll gladly refund your money.

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DISPOSABLE-TIP BORING BAR

YOU'VE BEEN WAITING FOR! (pat. pending)

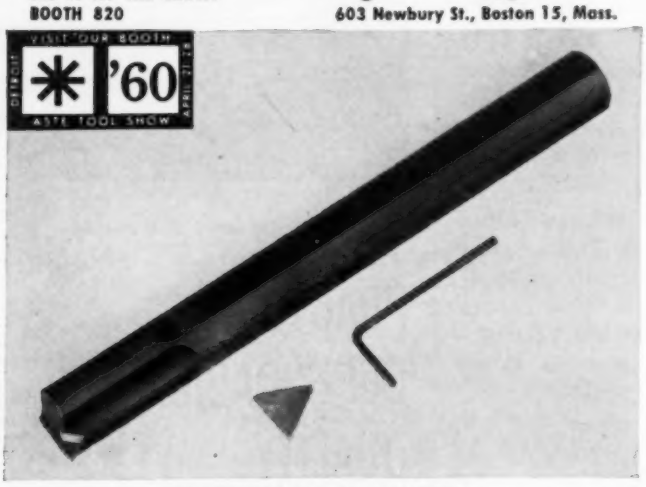
CRAFTS Newly developed #1000 Boring Bar is the result of months of testing on all metals. Six popular shank sizes plus tips in a wide variety of grades and radii give you all the advantages of Disposable Inserts even on the toughest job. Check these features: Solid construction • Triangular indexable inserts • NYLOK® Jack screws for size adjustment and clamping, won't shake loose • Positive Rake • Full flute • Four flats on rust-proofed shank • For further information write to:

Arthur A. CRAFTS Co., Inc.

another New Tool by CRAFTS

SEE IT AT THE SHOW!
BOOTH 820

603 Newbury St., Boston 15, Mass.



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NEWS OF INDUSTRY *continued*

district sales manager in Chicago and **George A. Gambee,** in Denver. **L. J. Hepworth** moves to San Francisco to replace Gambee, and **R. J. Horrocks** to Salt Lake City to replace Hepworth.

M. A. Sorenson is transferred from Denver to the contractor tool division in Chicago.

C. E. Hitch has been made manufacturing manager at F. Jos. Lamb Co., Detroit, Michigan.

Thomas L. Fitzgerald has been named field sales manager for the service products division of Johnson's Wax, according to an announcement by Edward J. Grant, division manager.

Lester F. Kuzmick, formerly vice president, manufacturing, for Felker Manufacturing Co., and **Fred K. Ryan,** formerly sales manager for the same concern, have joined Bay State Abrasive Products Company, Westboro,

C. E. Hitch

L. F. Kuzmick

Arthur Wilson

TURNABLE

the diamond tools with a **NEW TWIST!**

Cost No More—Last Longer!

A flick of the **wrist**
and
your diamond is
turned!

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The Only
Diamond Tool with
BUILT-IN TURNER!

ORDER ONE TODAY!

Shank and diamond sizes for all grinders. Send for FREE detailed literature. Distributor inquiries invited.

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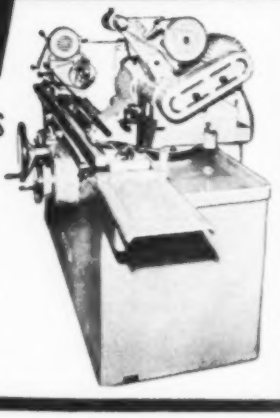
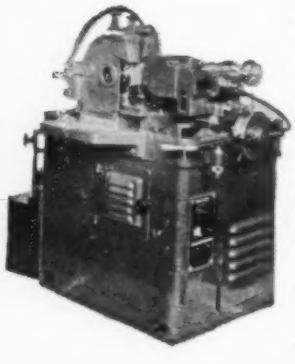
LOW COST GRINDERS

RIBON UNIVERSAL OD-ID GRINDERS

Electro mechanical models produced by one of Europe's largest grinding manufacturers—completely universal with swinging internal grinding heads. 14" x 1" O.D. Wheels.

11" x 20" $3750.00
11" x 32" $3950.00
11" x 42" $4200.00





CENTRI CENTERLESS GRINDERS

Close tolerance production units capable of .0001" tolerances in production. Equipped for bar feed, thru feed, and infeed work with automatic ejectors and automatic cycling on infeed where desired.

MODEL 0 Work diameters .012"-⅝" $2450.00

MODEL 1 Work diameters .016"-2" ($3650.00)

MODEL 3 Work diameter .030"-3" ($6750.00)

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1801 W. COLUMBIA AVE. CHICAGO, ILLINOIS

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Wm. J. Grede

W. H. Young

H. G. Altermatt

Mass., where they will be active in the manufacture and sale of diamond wheels and blades.

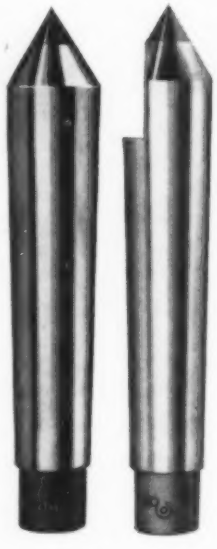
The appointment of **Arthur Wilson** as engineering manager, Industrial Section, Olson Filtration Engineers, division of the American Laundry Machinery Co., was recently announced. Another change in the Olson staff is the transfer of **Lowell Thomas** from the general engineering staff of the parent company to be field service engineer.

At a meeting of the board of directors of the J. I. Case Company, Racine, Wisconsin, **Wm. J. Grede** was elected president, succeeding **Marc B. Rojtman,** who becomes special advisor to the president and the executive committee.

William H. Young has recently transferred to the sales staff of the Ransohoff Company, Hamilton, Ohio. He has been associated with the company for over twenty years.

The Fuller Merriam Company has announced the appointment of **Howard G. Altermatt** to the position of sales engineer in the Philadelphia area.

Carl R. Lindell has been promoted to plant manager of the F. Jos. Lamb Co., Detroit, Michigan machine builders.



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for PRECISION
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CARBIDE CENTERS

The highly polished alloy steel shanks have a Rockwell "C" hardness of over 60. This prevents damage which effects their being properly seated in the grinder.

Precision is assured by testing for accuracy by means of precision testing instruments. Extension on shank prevents damage when center is removed from the grinder.

Extra long, highest quality carbide insert enables the point to be reground an endless number of times. Precision point is lapped to a mirror smooth finish.

Both centers and half centers are available in Brown and Sharpe, Jarno and Morse Tapers. They are available from stock in popular sizes. Write for prices and literature.

BENCO COLLET MANUFACTURING CO.
CLEVELAND 14, OHIO

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CIRCULAR FORM TOOL
SHARPENING FIXTURE!
(pat. pending)

Crafts New Circular Form Tool Sharpening Fixture #1004 takes all the guess work out of sharpening your Steel or Carbide Circular Form Tools. Fits all Tool & Cutter and Surface Grinders. Takes Tools from 1" to 4" in diameter and to 2" in width. Built-in Micrometer guarantees proper distance of offset. Worm feed lets you forget table feed. Selfchecking over gage plate. Fast, accurate, this Tool does not require skilled help. For more information write to: Arthur A. CRAFTS Co., Inc.

another New Tool by CRAFTS

SEE IT DEMONSTRATED, BOOTH 820 AT THE SHOW!

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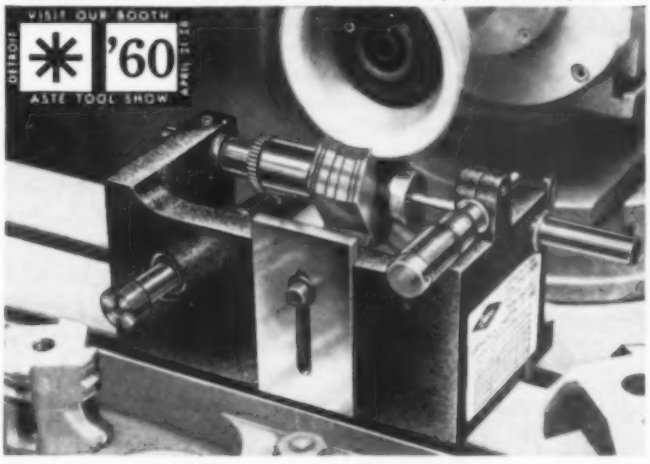

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AIRETOOL GRINDERS AND SANDERS...

for high speed rough and finish grinding

Grind better and faster with job-proven pneumatic grinders by Airetool. For heavy duty work, nothing beats the new Airetool 700-V vertical grinder with revolving guard. Well balanced and easy to handle, it takes a 6" wheel or brush. And, for precision work, feather edge sanding and fine metal finishing, there's Airetool's Model 500-V lightweight vertical sander with flexible pad. Takes up to 7-inch discs with three distinct models operating at 2300, 3000 and 4000 rpm. For information on Airetool's complete line, write for Bulletin 67.

AIRETOOL manufacturing company
SPRINGFIELD, OHIO
30 years' experience in pneumatic tools

BRANCH OFFICES: New York, Chicago, Tulsa, Philadelphia, Houston, Baton Rouge. **REPRESENTATIVES** in principal cities of U.S.A., Canada, Mexico, South America, England, Europe, Puerto Rico, Italy, Japan, Hawaii. **EUROPEAN PLANT:** Vlaardingen, The Netherlands. **CANADIAN PLANT:** Brantford, Ontario

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Wyzenbeek Expands

Wyzenbeek & Staff, Inc., Chicago, has added 6,000 square feet of space to the factory. The increase in space is expected to improve their production and shipping facilities.

L-R Metal Treating Corp.

A new company, L-R Metal Treating Corp., has been formed by the merger of L-R Heat Treating Co., of Newark, N. J. and Ace Metal Treating Corp. of Elizabeth, N. J.

Brown & Sharpe Appointments

Four appointments of sales executives have recently been made by Brown & Sharpe Mfg. Co., of Providence, R.I.

Joseph E. Kochhan has been named assistant general sales manager of the Industrial Products Division. He was formerly director of systems and audits.

Raymond H. Massie, his former assistant, becomes director of systems.

Axel Christenson has been appointed sales manager of Brown & Sharpe, Ltd., and is stationed in Plymouth, England. **Miller C. Barney** succeeds Mr. Christenson as international machine tool representative in Providence.

F. L. Paschke

Rotor Tool Sales Manager

Appointment of **Floyd L. Paschke** as sales manager has been announced by Herbert P. Bailey, president, The Rotor Tool Company, Cleveland, subsdiary of The Cooper-Bessemer Corp.

IMPORTANT NEW SHAPE IN WHEEL DRESSING

- Safe, comfortable Handle
- 6 Sets of Bearings
- Extra High Carbon Milled Cutter Teeth

Ask your distributor, or write direct for "Dresser Guide" and prices . . .

MACHINE PRODUCTS CORP.
127 Hollier Ave. Dayton 3, Ohio

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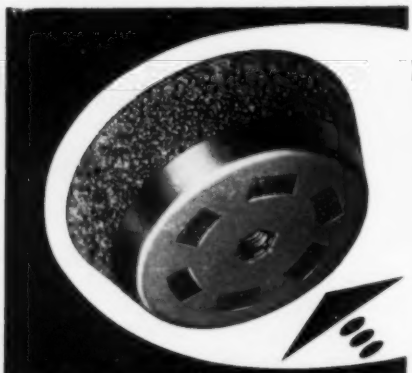

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FOR SAFETY-FIRST PERFORMANCE

Test results show that the safety factor is increased up to 75% when CARROLL SAFETY-GUARD-INSERTS are molded into your cup wheels. They conform to A.S.A. Safety code cup-guard requirements.
SPECIFY, ORDER and TRY Carroll's safety-guard-inserts now being used by over 50 grinding wheel manufacturers.

SPECIALISTS IN ALL TYPES OF GRINDING WHEEL METAL INSERTS

CPM INC

CARROLL PRESSED METAL, INC.
133 DEWEY ST.
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WALLS TU-WAY BELT SANDER

USE IT EITHER WAY

Full 1/3 h.p. G. E. Motor

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little. .

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request
A few desirable distributor territories still available.

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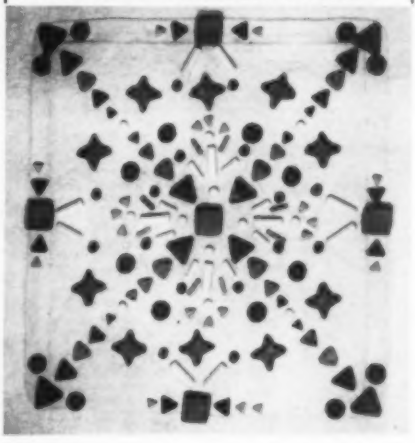
FORTUNE
BARREL FINISHING MEDIA FOR *ANY* TUMBLING NEED!



No jamming, or "rolling over" action.
Special shapes prevent jamming and rapid deburring saves costs.

Write for complete information.

Southeastern & Southcentral Territories Available.

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STANDARD HELICAL LAPS

Helical slot in lap gives faster lapping action and longer lap life—entire area in contact with work. Tapered arbor and I.D. of internal lap permit true expansion. External holder is retractable.
Holes with or without interruptions lapped true to 1 millionth. *Catalog furnished upon request*

AMERICAN LAP COMPANY

FINE GRAIN LAP IRON

INTERNAL WITH ARBORS — EXPANDABLE
Internal: 1/16" to 1-1/4" by 64ths, 1-5/16" to 3" by 16ths.

EXTERNAL WITH HOLDERS — CONTRACTIBLE
External: 1/8" to 1/2" by 64ths, 17/32" to 1" by 32nds, 1-1/16" to 2" by 16ths.

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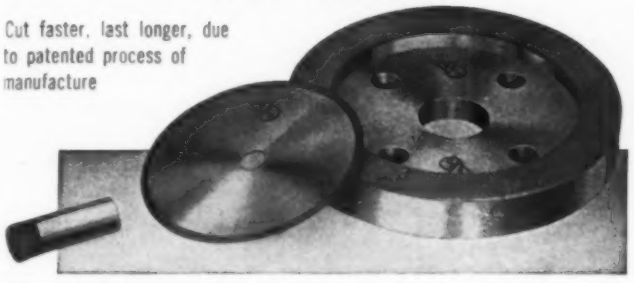
STEELSET

SINTERED STEEL BOND

DIAMOND WHEELS

(FOR WET GRINDING)

Cut faster, last longer, due to patented process of manufacture



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In standard and special sizes and shapes for:

OPERATIONS	MATERIALS
Grinding	Sintered carbides
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Honing, Lapping	Ferrite
Slicing, Dicing	Germanium, Silicon
Drilling	Glass, Quartz
Reaming	Marble, Granite
Generating	Ceramics, Porcelain
Pencil edging	Sapphire
Chamfering, Beveling	Boron carbide
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We specialize in NON-STANDARD requirements. Send us your prints for quotation.

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highly break resistant

CROWNFLEX

DISCS and ABRASIVE MOPS

result in automatization of surface working with the application of the abrasive mop on suitable machines.

Effective and economical for grinding and polishing in all industrial branches—metal, steel, automotive, building, stone, plastic art industry, etc.

Inquiries invited and samples provided those interested in importing our abrasives—agents distributing our highly valuable products—also manufacturing on a license basis.

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Grinding Wheel ADAPTERS

TOOLROOM ACCESSORIES

FREE Catalog

- **For Use on All Popular Surface Tool and Cutter Grinders**
- **Precision-made, Hardened & Ground with Heat Treated Nuts**
- **Complete Line—4 New Models of Adapters Available**
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WM. SOPKO & SONS CO.

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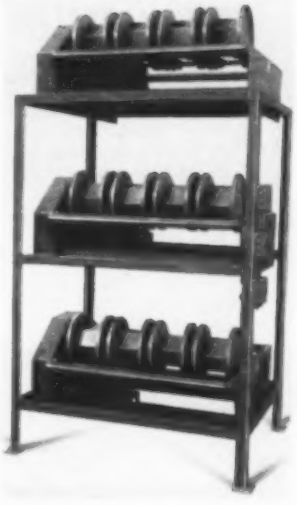
COMPACT, MULTI-BARREL

RAMPE ROLLABRADER



is real cost saver for small parts finishing

Think how many ways you can use this portable, flexible, and easy-to-use barrel finisher. The Model RA4 measures only 31" long x 38" deep x 25¼" high—yet it gives you four compartment utility, variable speed drive, and a wide range of precision performance. Two or three tier models (3-tier shown at left) are available. Each barrel has two-quart capacity, orange "No-Seam" vinyl plastic lining.

Find out how you can reduce costs, improve output, gain better results with the RA4. Send for details and prices today.

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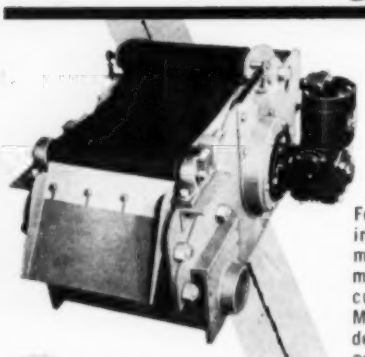
GALE OFFERS 5 COOLANT CLEANING AND OIL SEPARATION EQUIPMENT for the metalworking industry

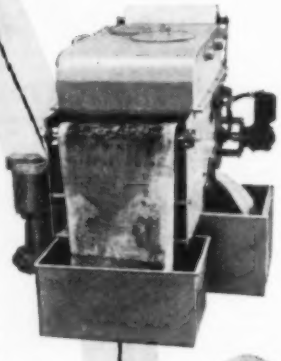


1 MAGNETIC CLEANING

Ferrous metal particles produced in grinding, honing and other machining operations are removed from any type coolant or cutting oil by the "GALE" Magnetic Separator. Solids are delivered near-dry for easy disposal.

2 NON-MAGNETIC CLEANING

Ferrous and non-ferrous metals as well as non-metallic solids are removed from coolant liquids with equal efficiency by the IMPINJO® Filter. An automatically controlled moving filter medium simplifies disposal of waste solids.

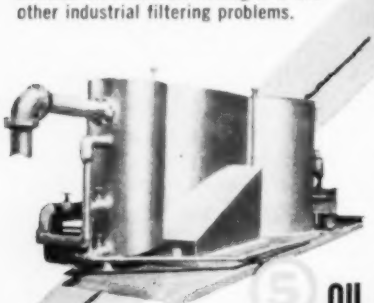


3 EXTRA FINE CLEANING

Grinding and polishing to a low micro-inch finish requires abrasive-free recirculating coolants. Diatomaceous filtration removes surface-damaging micronic and colloidal solids. Recommended for aluminum rolling oils and other industrial filtering problems.

4 CENTRAL SYSTEM PURIFICATION

Centralized cleaning to serve many machines using the same coolant is accomplished by flotation and sedimentation. The SEDI-FLOTOR® Clarifier is available in capacities for any coolant flow requirement.



5 OIL SEPARATION

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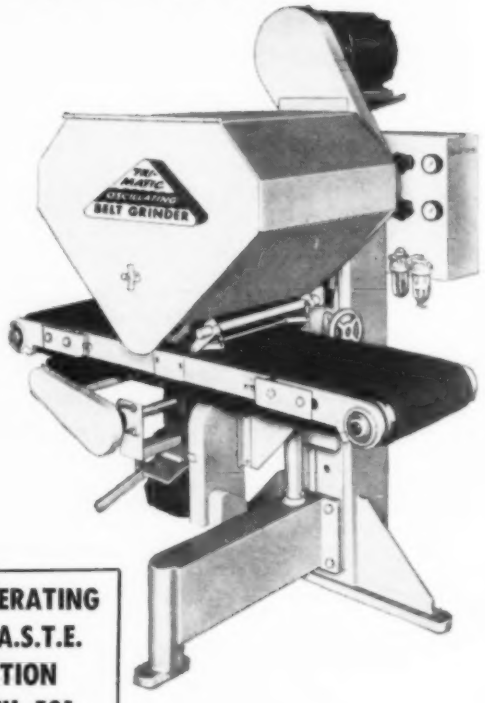

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GRINDING and FINISHING

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Coming Next Month

Abrasive Cutting Grows Up
Abrasive cutting, once regarded as a lab or toolroom operation, is now widely accepted as an efficient method for cutting a wide variety of industrial materials, including the hardest alloy steels and exotic metals. It's fast, frequently eliminates preparatory or finishing operations. Read all about it in this basic, comprehensive article.

Grinding Honeycomb With Bonded Wheels
An application in the Grumman aircraft plant indicates that bonded wheels on a straight surface grinder may be more efficient than conventional methods in grinding honeycomb.

Correct Grinding Procedures for Carbide Milling Cutters
Basic information, well-illustrated with "how to" sketches and photos, on how you can get more life out of carbides.

Surface Grinding Hot-Rolled Steel
Documentary showing how surface grinding has replaced cutting type machining for finishing hot-rolled steel press parts at Clearing Machine Company. The change has increased efficiency and reduced costs by eliminating cutter breakage and down time.

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A Final Thought

There Is Concern Over Our Industrial Future

We are not dancing with joy over the future in spite of the glowing statements made by soothsayers and crystal-ball gazers. This is possibly due to our having our nose too close to the industrial grindstone and to our watching, with trepidation, the withering away and the aging of our industrial facilities. Possibly, we see but one small aspect of the growth of our nation, its productive potential; yet, this being the backbone of our country it merits close attention, especially when one sees the backbone becoming soft and yielding.

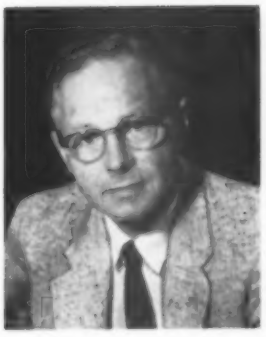
We are frankly concerned over our industrial future. As long as we operate in an inflation economy with a childish disregard for this situation in terms of depreciation allowances we will never meet the challenges of the future: Population Boom, Adequate National Defense, Foreign Competition and Products Improvement.

We are not so far away from the time when our gross national product will reach $700 billion and our population 200 million, at which time American industry will be expected to provide not only the same standard of living as we enjoy presently, but to reach even higher standards. Defense demands will mount and industry must be ready for any emergency. Foreign competition will accelerate to gigantic proportions. Product improvement is a life-or-death matter.

The horrible, the insane, the absolutely idiotic part of it all is that the biggest obstacle to the meeting of these challenges is our own government. True, tax laws have recognized the necessity of permitting the accumulation of funds for facility and production equipment replacement purposes, but the law makes no provision for inflation. The dollar which was used for the purchase of plants and equipment in 1941 had shrunk to 41 cents in 1958. This is a 59 per cent decline in purchasing power. But the funds accumulation allowed by present tax laws remains unchanged. One would think today's dollar buys as much as it did in 1941.

This cannot go on. Our Statesmen in Washington must realize that at the present rate—and there is nothing in the air to suggest that this will change—at the present rate of inflation the dollar will be worth only 35 cents in 1967 in terms of 1941 dollars.

There are, of course, answers. Industry must bite into the sour apple for them: raise prices, thus advancing the inflationary spiral; cut wages, over labors' dead body; retain the old clunkers and firetraps and lose our world position and suffer a decline in business, profits and standard of living; raise money by borrowing and also by retaining more from earnings, thus discouraging the natural flow of capital from investors. We would also be creating debt and monetary problems.



These answers are disturbing, inadequate and impractical; possibly they're palatable to economic theorists or to a committee of sheep herders, but not to businessmen.

We must appreciate that there is a built-in brake on industrial progress. Cognizance must be taken of the difficulty of replacing 1960 equipment in terms of 1941 dollars. Progress during the last 20 years has been fantastic in everything except tax allowance and depreciation.

Is progress limited to only technology? It is too much to assume that modern tax thinking should advance shoulder to shoulder with modern industrial thinking? Why should industry plod onward and look forward while tax experts sit by silently and contemplate their navels?

Wm. J. Schleicher

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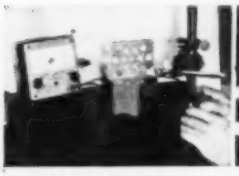
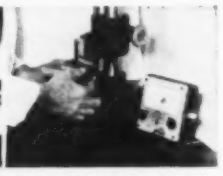


INDICATOR GAGE HEAD used with standard height gage-stand for surface plate work.

AGD GAGE HEAD used with snap gage for production line inspection.



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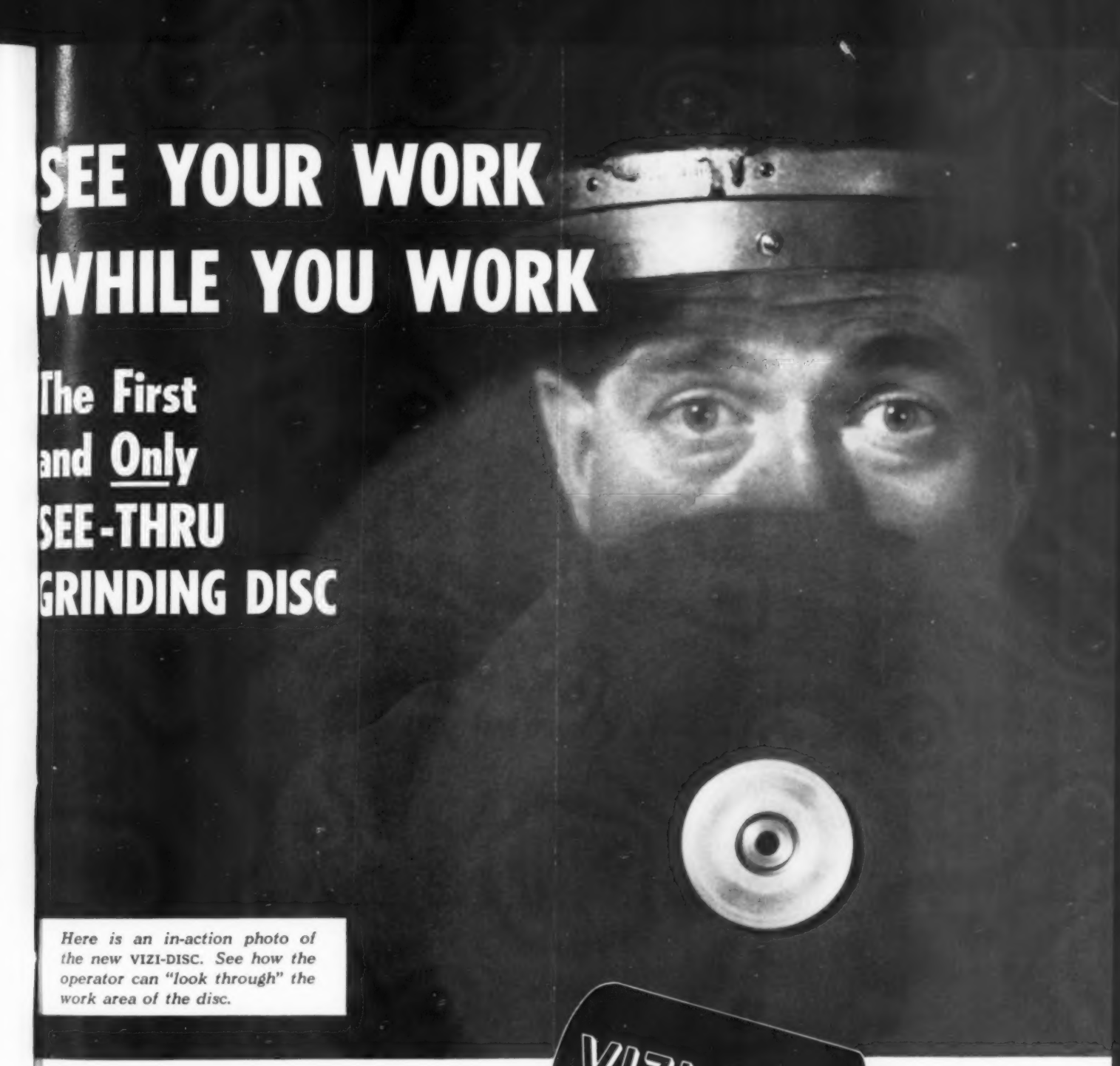

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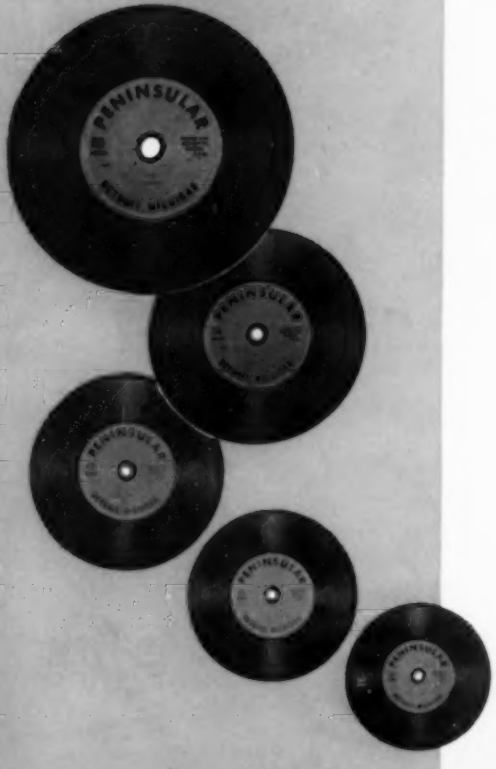

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